ENGINEERING AND
# BOILER HOUSE REVIEW

ESTABLISHED 1899

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VOL. 73 NO. 5 • THE PIONEER STEAM JOURNAL • MAY, 1958

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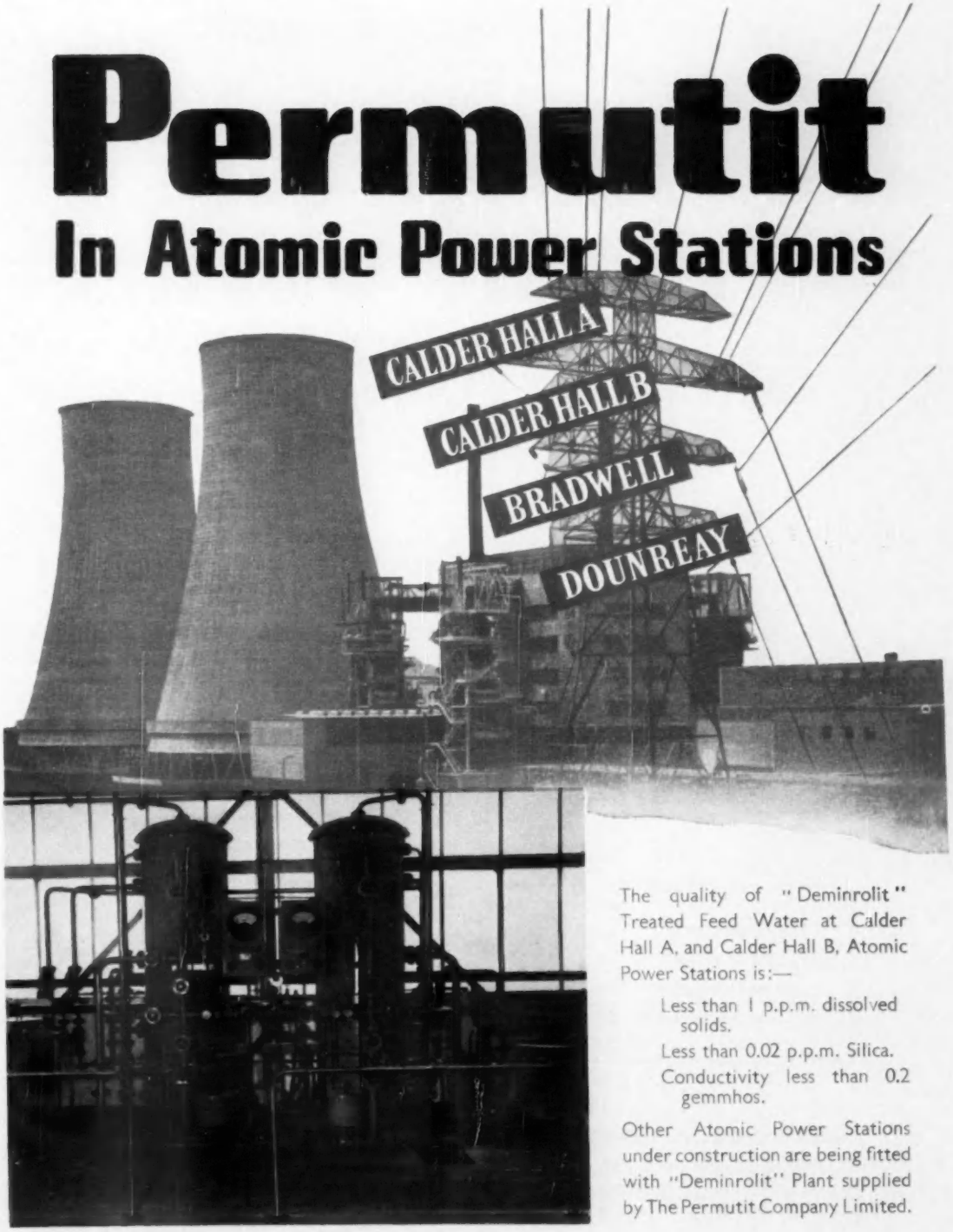
## In Atomic Power Stations

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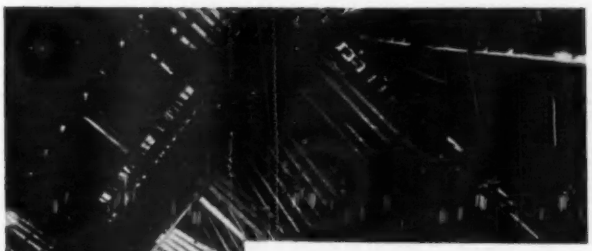

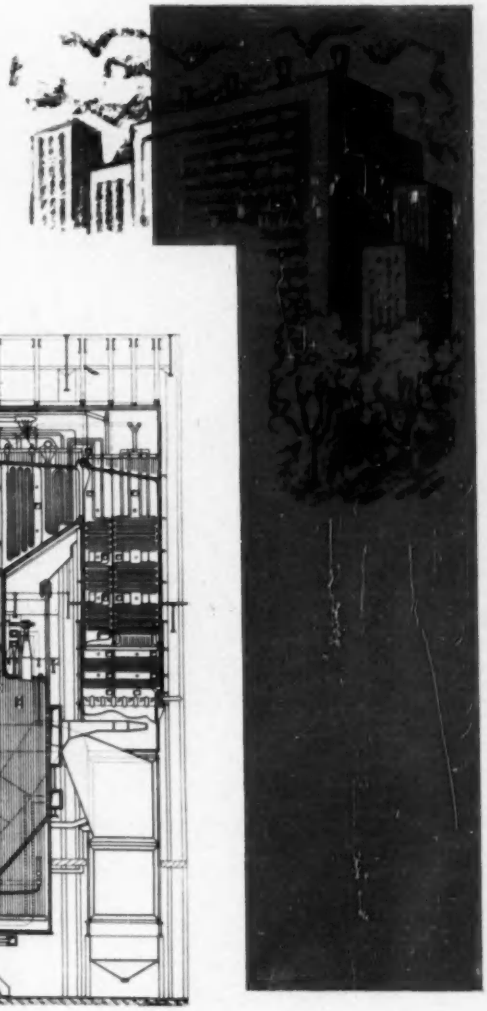

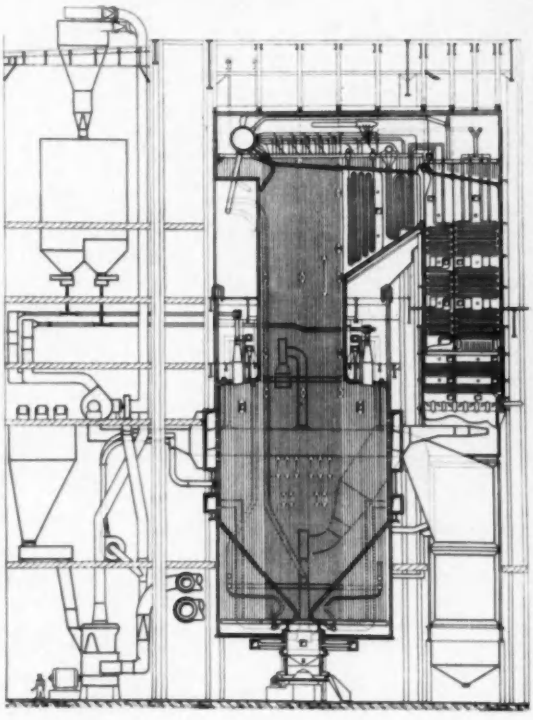

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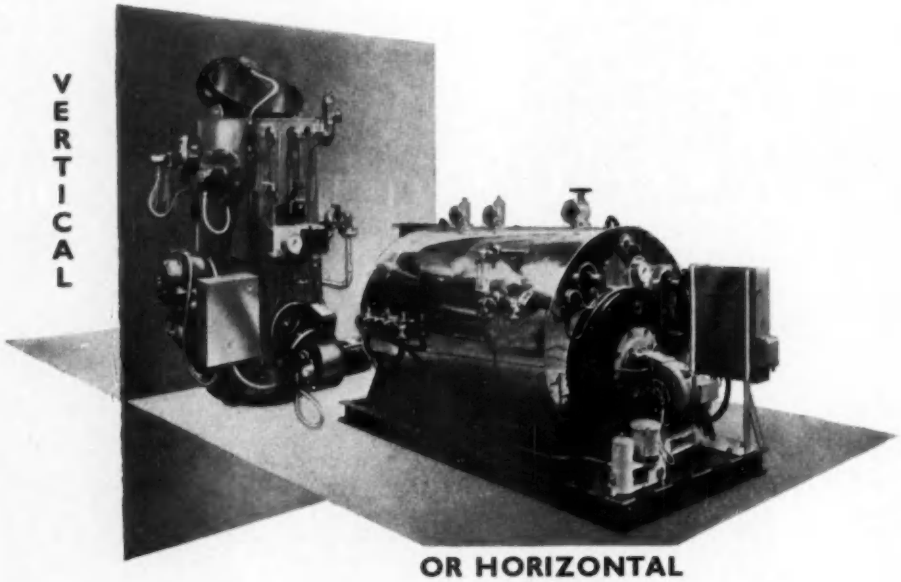

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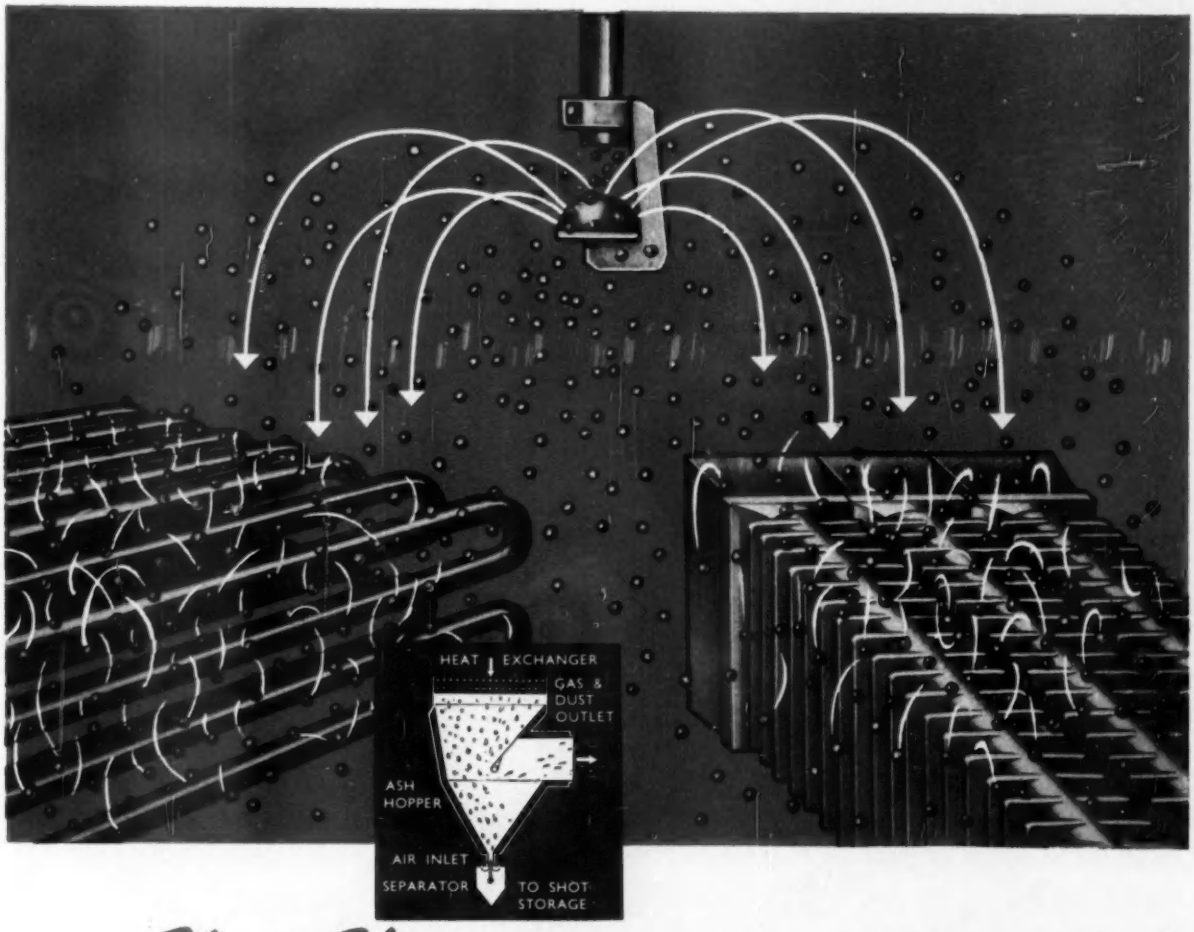


# *Shot Cleaning* maintains constant temperature in heat exchangers at all times

**GET MAXIMUM EFFICIENCY from new heat exchangers; recover lost power from old. Install the KEITH BLACKMAN-BROMAN EKSTROM SHOT CLEANING SYSTEM which, irrespective of fuel (coal, oil, waste heat, sulphite, sulphate liquor or creosote pitch), offers many indisputable advantages:**

SHOT CLEANING maintains continuously, constant temperature in the boiler, economiser or preheater—by dislodging deposits from heat transfer surfaces *before* thermal efficiency or boiler draught is affected.

SHOT CLEANING acts with the boiler under full load —no shut down, no dampering back. It ensures plant availability all the time—requires no outages for cleaning.

SHOT CLEANING is a dry cleaning method—no steam, no air, no water is introduced to affect the dew point of gases, as in conventional methods.

SHOT CLEANING permits the installation of the right size heat exchanger—no need now for the larger than necessary plant which allows for gradual decline in efficiency.

SHOT CLEANING has proved its effectiveness in POWER STATIONS, GAS WORKS, FOUNDRIES and other INDUSTRIAL PLANTS throughout the world including Europe, U.S.A., Canada, U.S.S.R., Japan and India. Your enquiry benefits from the experience gained from the installation of hundreds of such plants.

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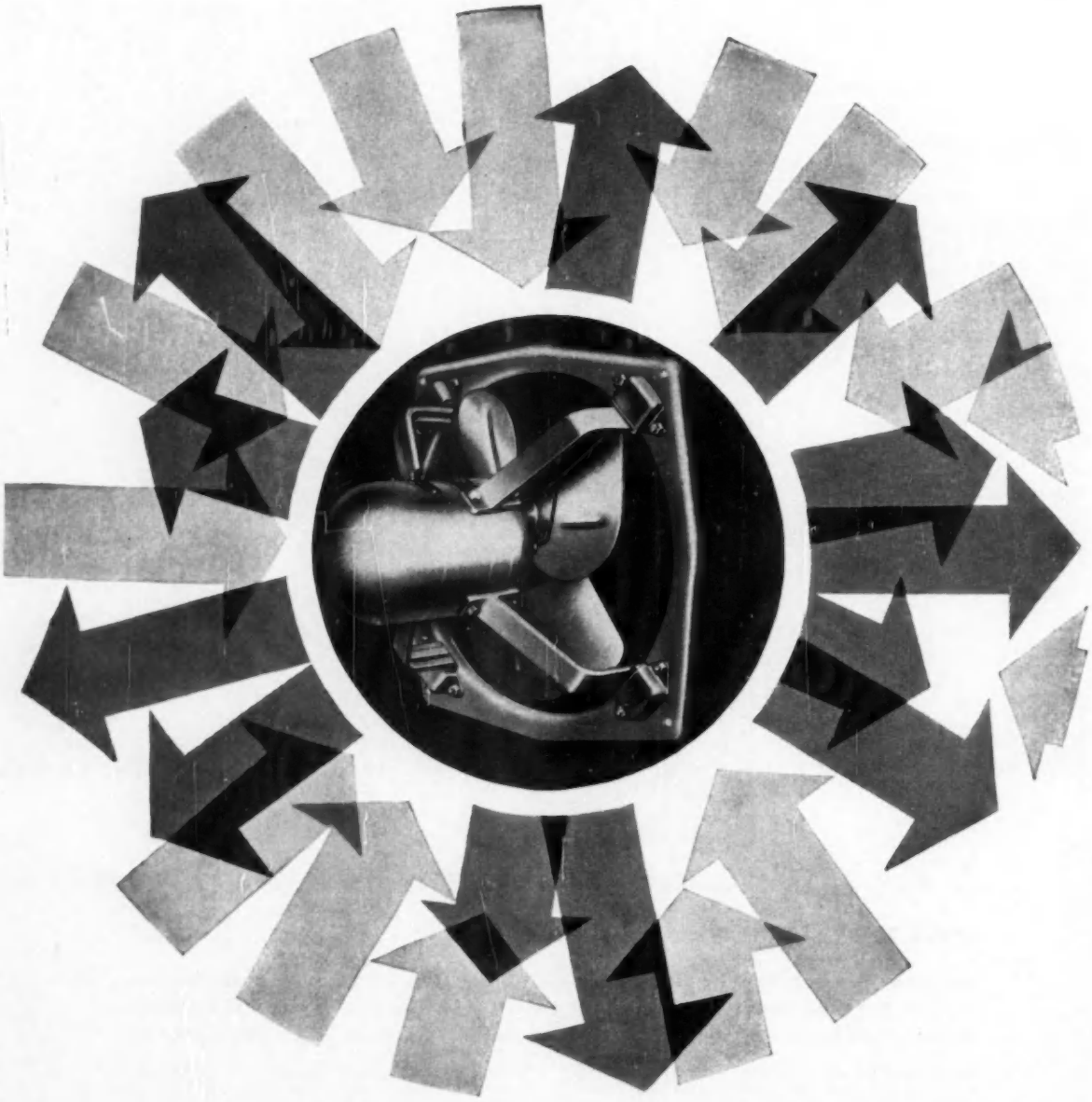

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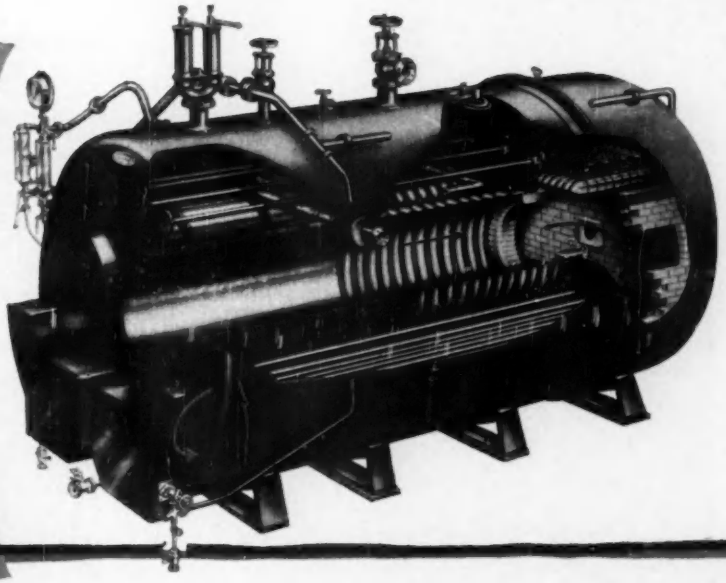

*An oil-fired Super Economic Boiler installation at Messrs. R. Paterson & Sons Ltd., Camp Coffee Works, Glasgow.*

This three-pass boiler, of sturdy welded construction, is the answer to the modern need for efficiency *and* trouble-free service. Large heating surfaces within its comparatively small shell make it a space-saver too. Full range, from 2,000 to 21,000 lb./hr. evaporation, suitable for coal or oil firing. John Thompson (Wilson Boilers) Ltd., will gladly discuss the suitability of their Lancashire, Economic and Super Economic boilers and auxiliaries to meet your requirements.

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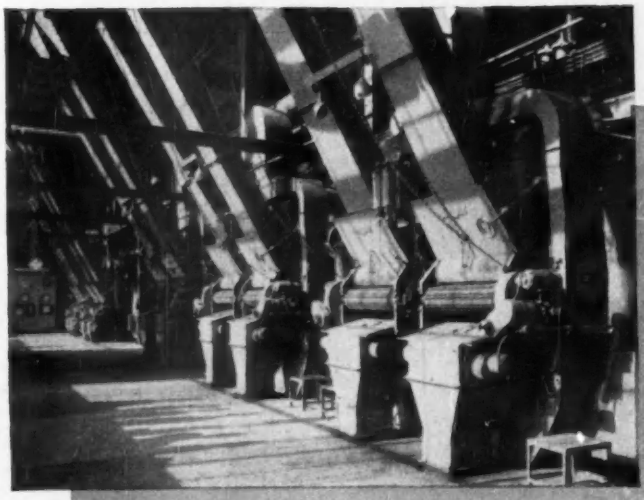

*John Thompson Triumph Travelling Grate Stokers and handling plant serving five boilers at Joseph Sankey & Sons Ltd., Bilston. Consulting Engineers for this new boiler plant were Messrs. Powell Duffryn Technical Services Ltd.*

### THE THOMPSON TRIUMPH TRAVELLING GRATE STOKER

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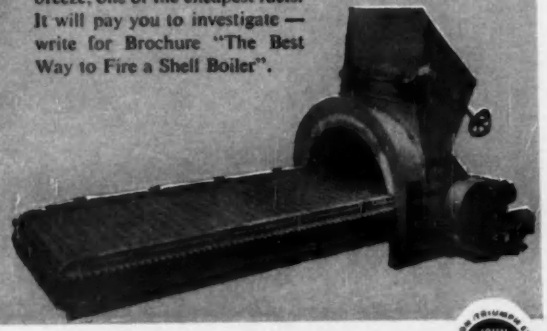
A modified Thompson Triumph Travelling Grate Stoker is available which will successfully burn coke breeze, one of the cheapest fuels.

It will pay you to investigate — write for Brochure "The Best Way to Fire a Shell Boiler".



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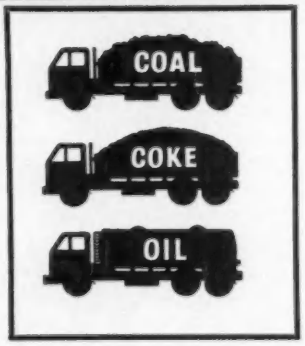
and to-day, world events make it more imperative than ever to get the utmost efficiency from every type of fuel. Coal, coke or fuel oil . . . which is best for your heating? Hargreaves, who distribute all three, can give you expert and completely impartial advice.

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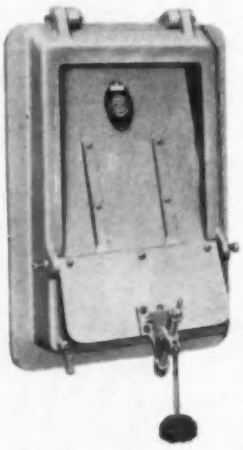

*The Original "Combustion" Draught Stabilizer*
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The acknowledged fool-proof fuel-saver

***Maximum Efficiency and Fuel Economy*** can only be obtained from your combustion appliance if all variations in chimney draught are entirely and automatically eliminated by fitting this simple, fool-proof and everlasting apparatus.

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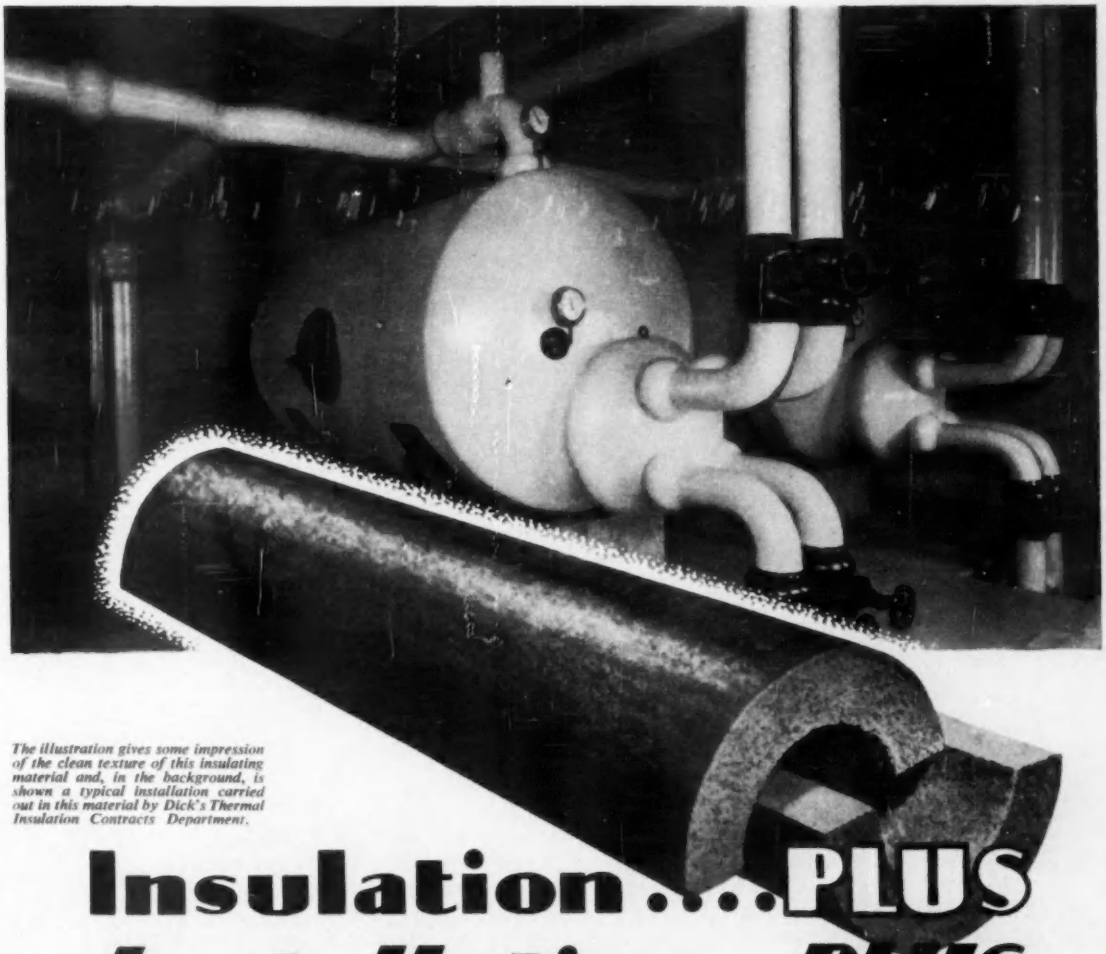

*The illustration gives some impression of the clean texture of this insulating material and, in the background, is shown a typical installation carried out in this material by Dick's Thermal Insulation Contracts Department.*

# Insulation ... PLUS
# *Installation .. PLUS*

**Dick's "Antithermic" is a super-efficient thermal insulating material which is strong, light, easy to cut and clean to handle and uniform in structure. It is made from 100% selected amosite asbestos fibre and is supplied in pre-formed pipe sections and slabs of all usual sizes.**

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**(100% Asbestos)**

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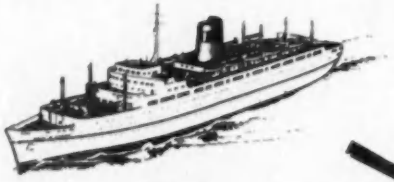

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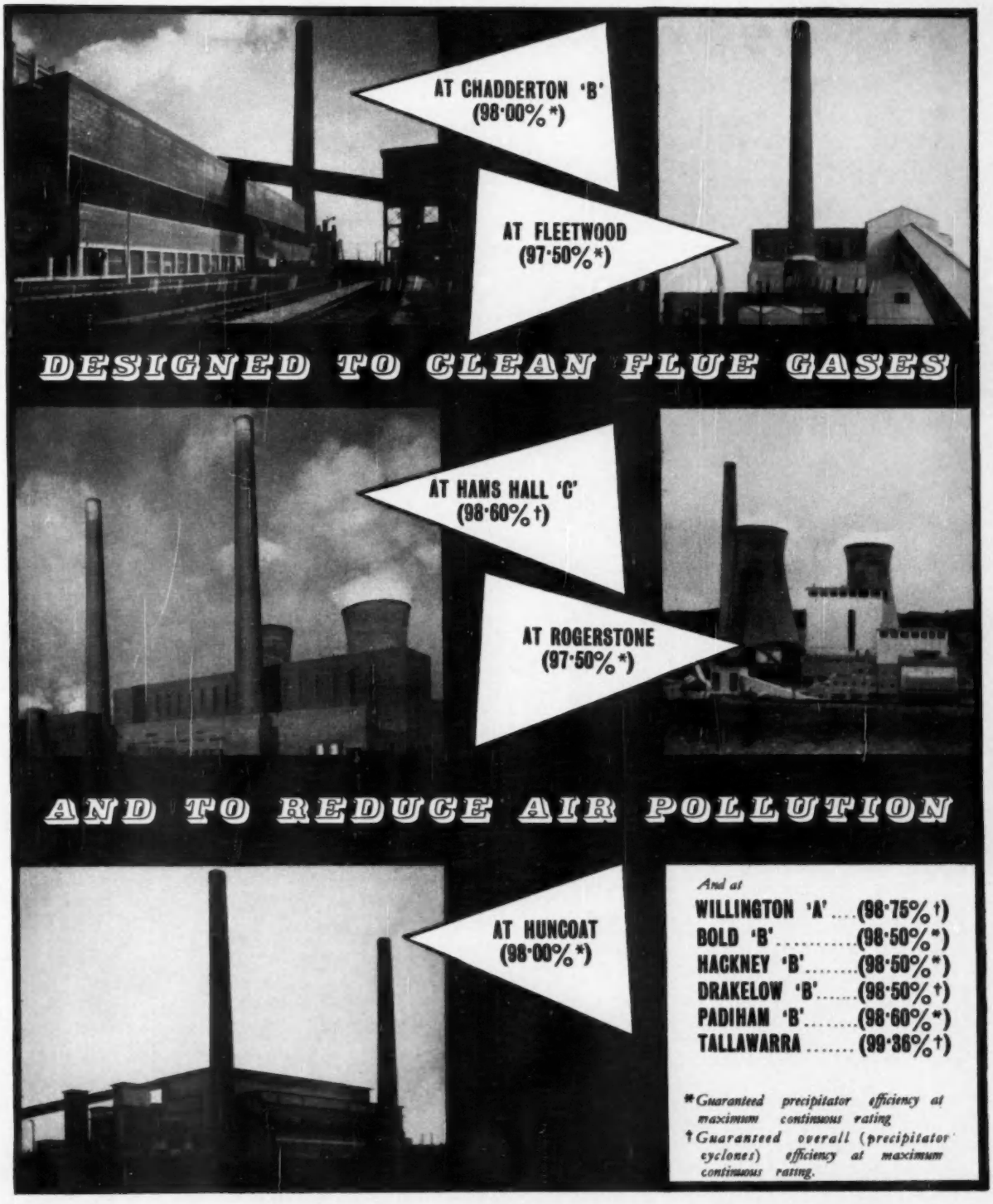


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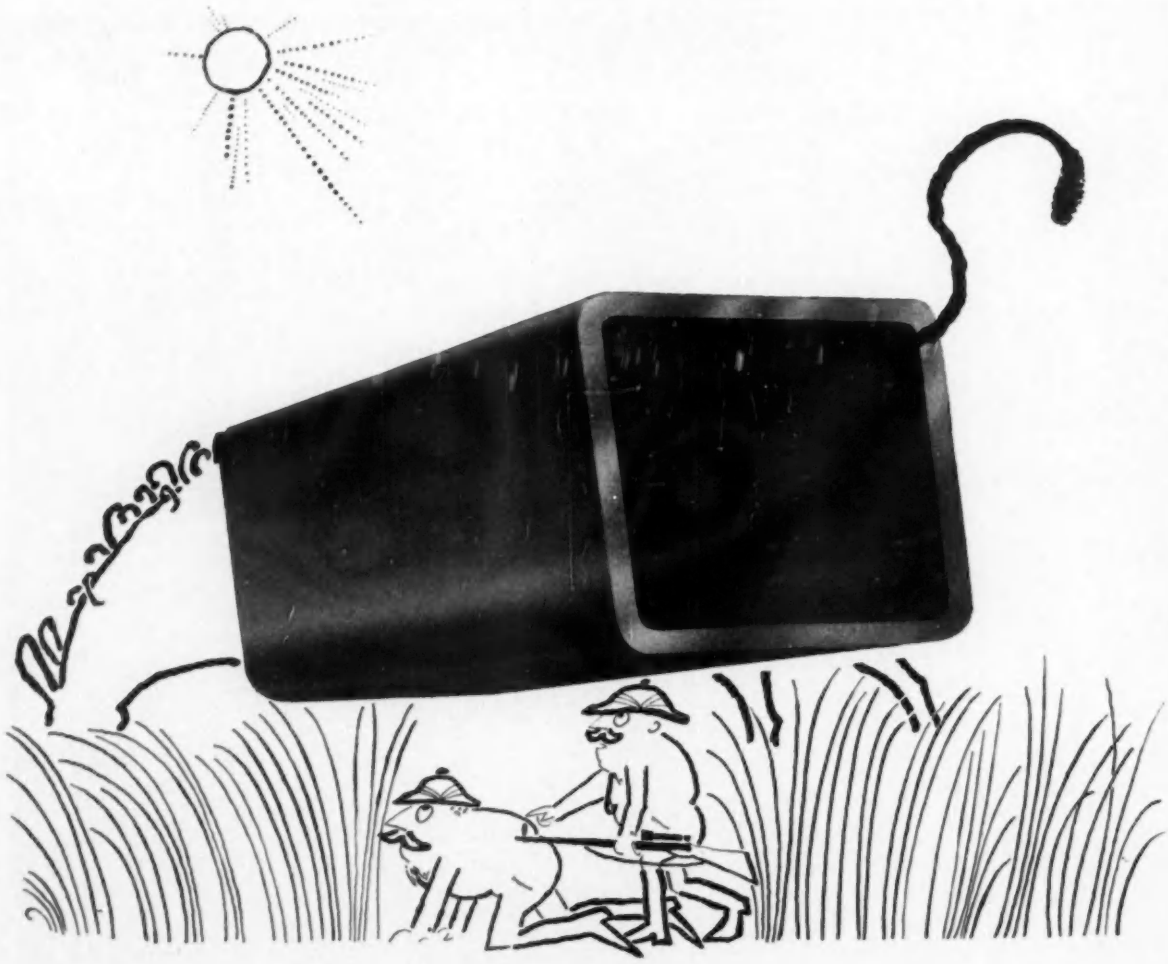

What kind of bally animal is *that*?

**Just look at its hulking great body gleaming in the equatorial sun!**

Seems to be made of steel — hot drawn by the Chesterfield process.

**By Jove! I think you're right. Not a seam, a weld or a join . . .**

We'll have to report this to the Zoological Society or something.

**They'll never believe us, of course.**

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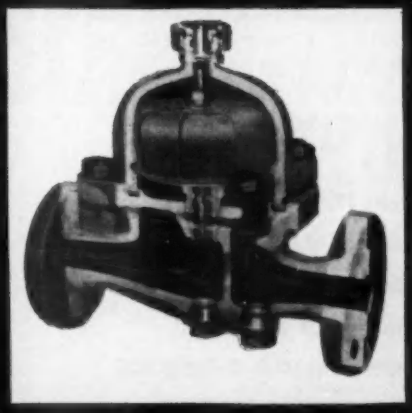
**GESTRA Steam Traps have dual automatic control. Normal fluctuations are controlled by the Stage-Nozzle. Response to abnormal fluctuations are assisted by the GESTRA Thermovit Regulator This is a crown-shaped claw of special corrosion-resistant steel — GESTRA DUO-Steel P53 — which expands and contracts in unison with changes of temperature and pressure. It is associated with the Stage-Nozzle and automatically regulates the nozzle opening.**

# GESTRA

## stage-nozzle Bi Condensomat



## *positive fully automatic steam trap IK*

A unique method of control, sensitive to all fluctuations in quantity, pressure and temperature, makes it possible for this fast re-acting steam trap to discharge large quantities of condensate within a matter of seconds when starting up, continuously discharge normally accumulated condensate, and to operate automatically when quantity, temperature and pressure exceed the normal.

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**Lafarge Aluminous Cement Co. Ltd.**

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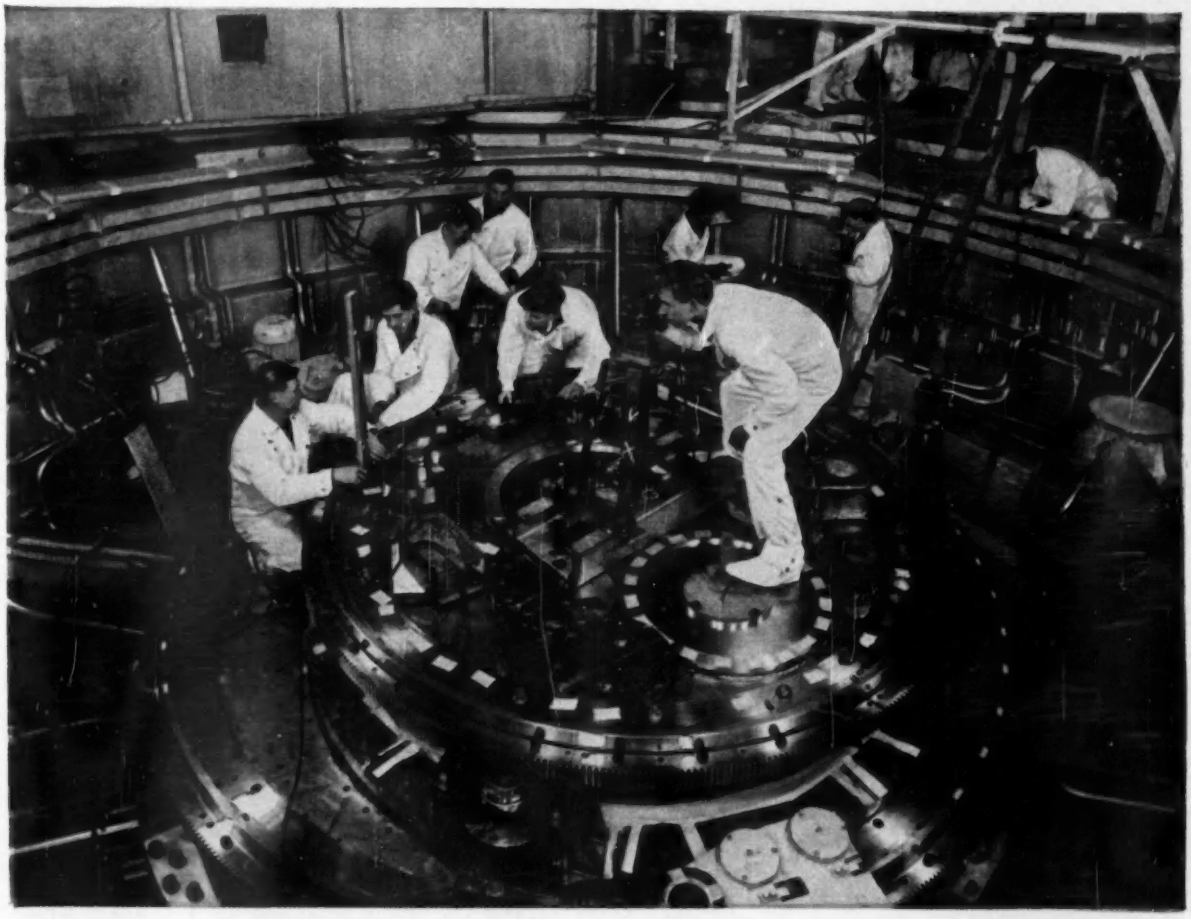

*Work in progress under conditions of extreme cleanliness on the top of the stainless steel vessel containing the fast reactor at Dounreay. The vessel is placed centrally in a concrete "vault" containing primary liquid metal circuits and heat-exchangers. The vault is in turn contained in the giant steel sphere which is the well-known exterior aspect of Britain's full-scale fast breeder reactor.*

# TAKING HEAT FROM ANY SOURCE- AND UTILISING IT

Whether the fuel is nuclear, or coal, oil, gas or waste gases, the job of the boiler maker is to extract its heat with the utmost efficiency consistent with maximum availability of plant and lowest costs for labour and maintenance. This John Thompson have been doing increasingly well for over a century. And since efficient operation involves not only the boiler itself, but all its auxiliaries, the John Thompson Group offers a COMPLETE service, comprising every aspect of steam generation—materials handling, water treatment, shell or water tube boilers, instrumentation, ash removal, chimneys etc. Integrated design and manufacture by the John Thompson Group points the way to true efficiency.

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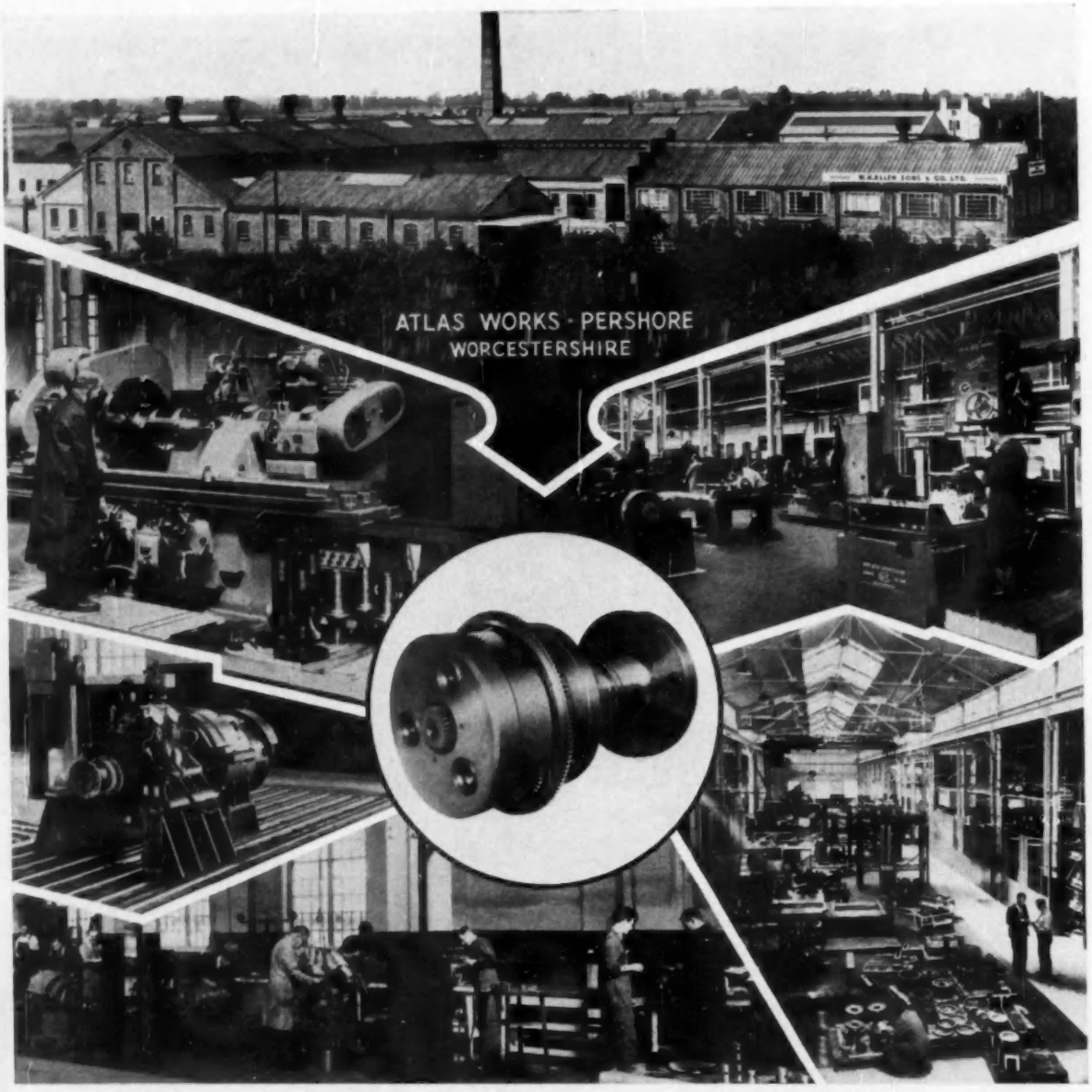



*Specializing in the production of*

# ALLEN-STOECKICHT EPICYCLIC GEARING

For many years W. H. Allen Sons & Company Limited have been engaged in the design and production of gear units for industrial and marine applications. The production facilities have been progressively expanded and developed in conformity with the great advances in gear cutting technique and, as a result, this Company's gears continue to be among the best and most accurate produced.

To-day, Allen gearing is manufactured at Atlas Works, Pershore, which is a highly specialized organization, staffed by skilled personnel and equipped with some of the most up-to-date precision machinery in the world for the quality production of epicyclic gear units. These are built for powers up to **20,000 h.p.** with ratios of 12 : 1 in a single train, and 144 : 1 in a double train unit.

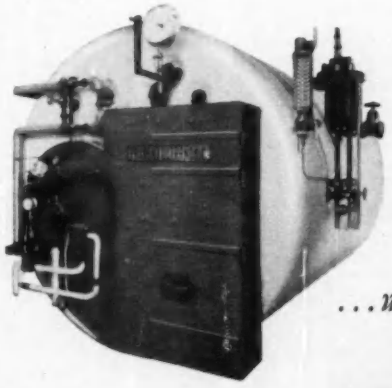
**W. H. ALLEN SONS & Co LTD**

**BEDFORD** **ENGLAND**

*Paxman' Ultranomic' boilers provide the entire heating system for the 424 flats at the Alton Estate, Roehampton*

*Designed by the London County Council's Principal Housing Architects Development Group, in collaboration with Ove Arup and Partners, Consulting Structural, Heating and Ventilating Engineers.*

# ... modern buildings need modern BOILERS!



Heating and ventilating experts know that only with the finest installations can an architect's plans be effectively fulfilled—that's why, when it's a question of efficient and economical heating, PAXMAN boilers are always first choice.

Davey, Paxman & Co. Ltd. are—and always have been — that one step ahead in boiler development and manufacture. For this reason they confidently say . . .

*. . . whatever your problem—Paxman have the answer!*

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*As supplied to the Admiralty, Central Electricity Authority, Railways, Oil Refineries, leading Boiler Makers and Industrial users.*

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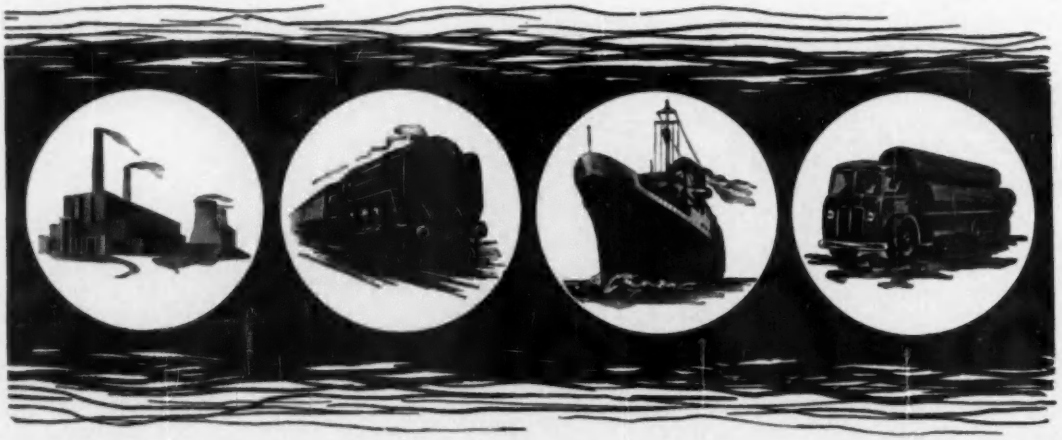

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# New Landmarks

## IN BOILER DESIGN

240,000 lb/hour at 3,300 p.s.i. and 1,060°F

860,000 lb/hour at 1,600 p.s.i. and 1,010°F

Simon-Carves Ltd have broken new ground with two recent orders for boiler plant.
At Margam, for the Steel Company of Wales, they are building a once-through forced circulation boiler to generate 240,000 lb of steam per hour at 3,300 p.s.i. and 1,060°F with reheat to 840°F.
This is the first Benson-type boiler to be built in Britain and the steam conditions are the most advanced ever commercially used in this country.
At the Padiham 'B' power station of the Central Electricity Authority, Simon-Carves are to build a 120-MW reheat boiler unit of the continuous-slagging type. This unit, which will generate 860,000 lb per hour of steam at 1,600 p.s.i. and 1,010°F with reheat of 785,000 lb per hour to 1,005°F, will be one of the first, if not actually the first, of this type to be built in this country.
It will convert the whole of the ash and the dust into slag and thereby both avert the nuisance of handling and disposing of fine ash and produce a usable product.
At the same time, Simon-Carves are busy at home and abroad on the design and construction of conventional boiler plant—a speciality in which they have long played a leading part.

*Complete power plant*
***by Simon-Carves Ltd***

SIMON ENGINEERING GROUP

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SC181

# Instrumentation in the boiler house

## *ensures correct conditions and fuel economy*

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**Draught . . .**

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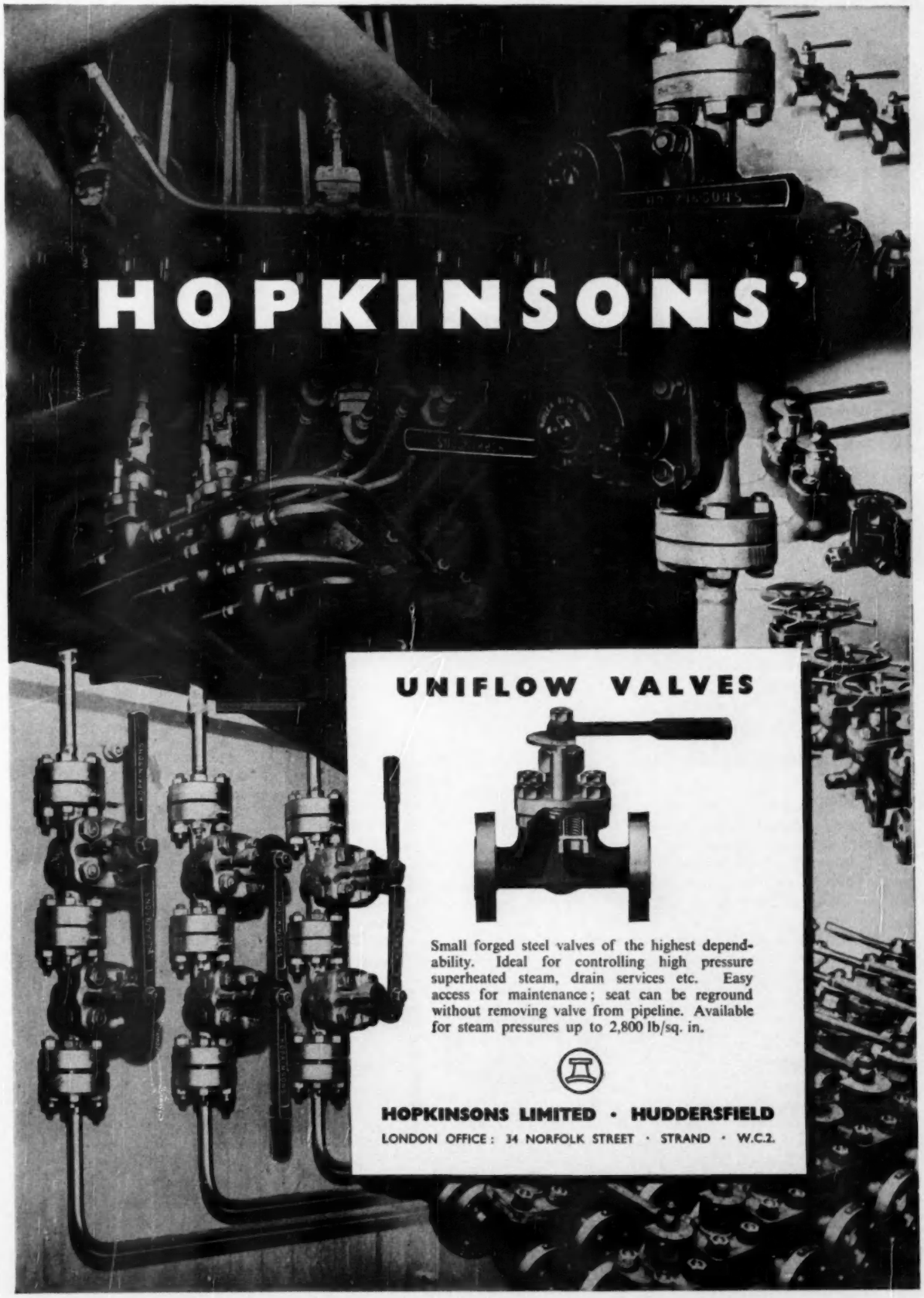


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Small forged steel valves of the highest dependability. Ideal for controlling high pressure superheated steam, drain services etc. Easy access for maintenance; seat can be reground without removing valve from pipeline. Available for steam pressures up to 2,800 lb/sq. in.

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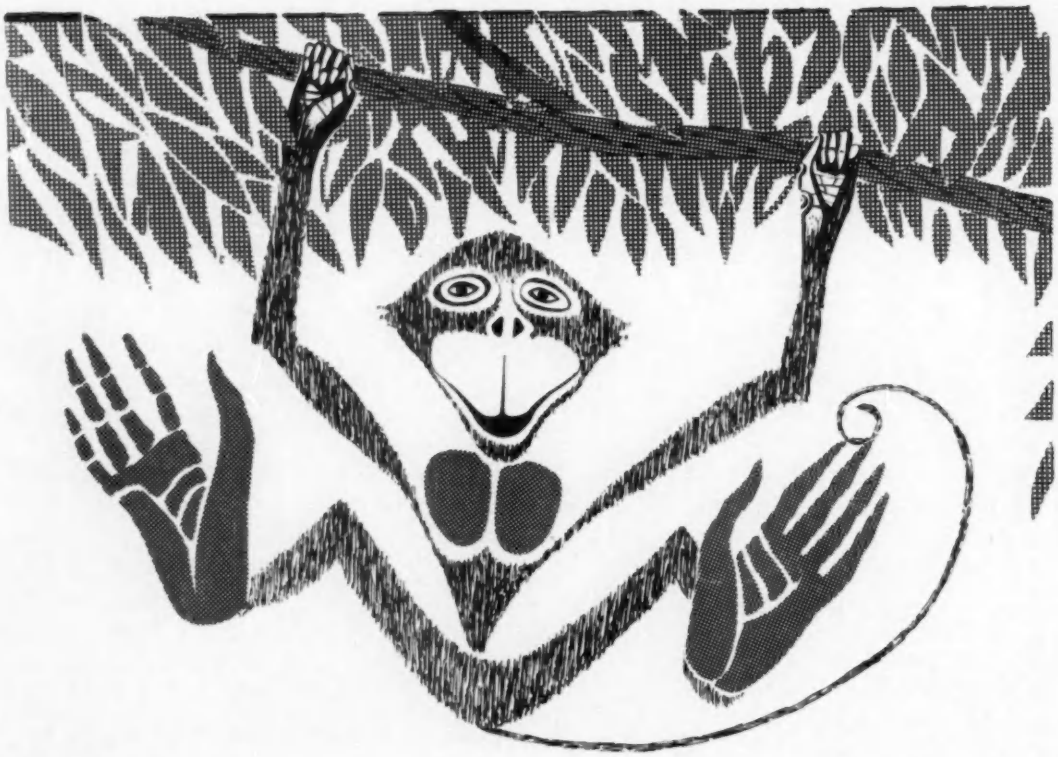

# He would just say 'nuts' to it!

The problem of boiler corrosion is not a thing to be dismissed lightly though. It is too costly in its effects. But the remedy need not be. "Apexior Number 1"—as used by leading manufacturers of boilers and all steam raising plant for over 50 years—is absolute proof against corrosion where wet temperatures of 175° to 1000°F are encountered. At least 12 months' protection is assured with a double coat of "Apexior Number 1"—mechanically or brush applied. After the initial treatment only one coat is necessary. This also eliminates problems that are presented by scale (danger of damaging boilers by excessive chipping), as Apexiorised surfaces do not support deposits firmly; scale is looser—more easily removed.

In certain industries it is a most important advantage of "Apexior" that it does not affect water by taste, taint or smell. Be guided by half a century's experience—send for your copy of the "Apexior Manual".

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But for cold-wet surfaces up to 125°F.—use "APEXIOR NUMBER 3"

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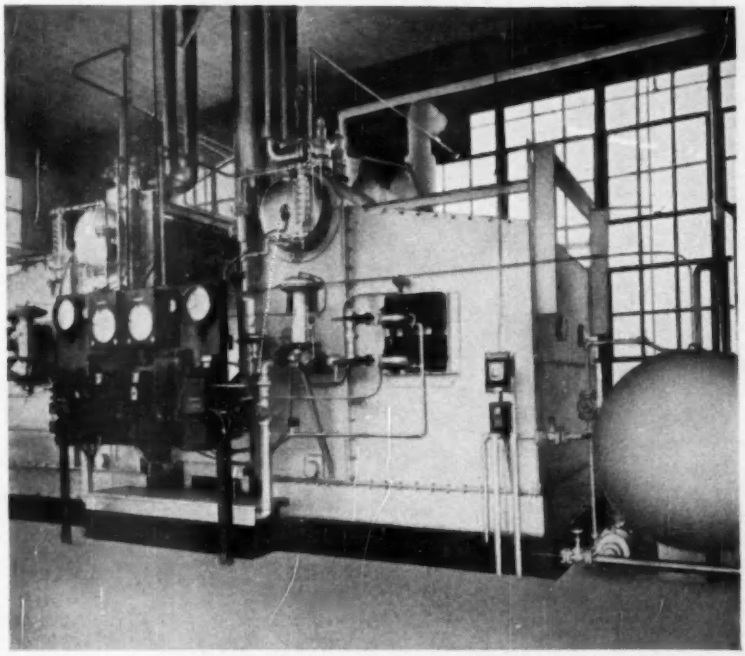

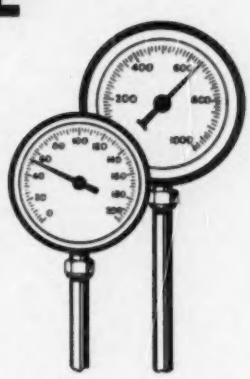

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**FW*** Dowtherm heating systems provide a vapour temperature range of 500°F to 700°F at vapour pressures of 15 p.s.i. to 110 p.s.i. absolute, fraction-of-a-degree temperature control, uniform temperatures throughout each processing step, fully automatic operation and low maintenance and repair costs.

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* *Dowtherm—registered trade mark of the Dow Chemical Company.*

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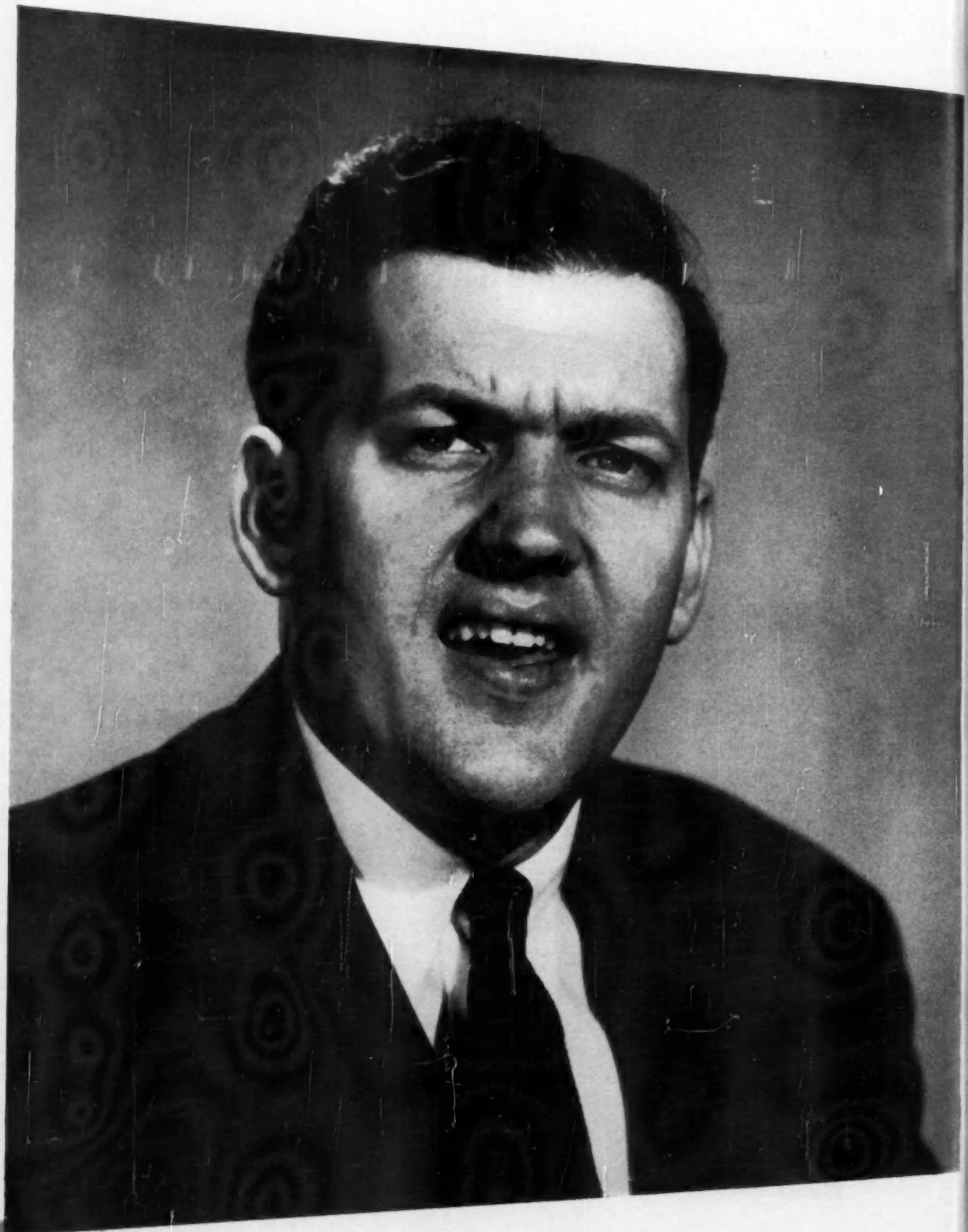
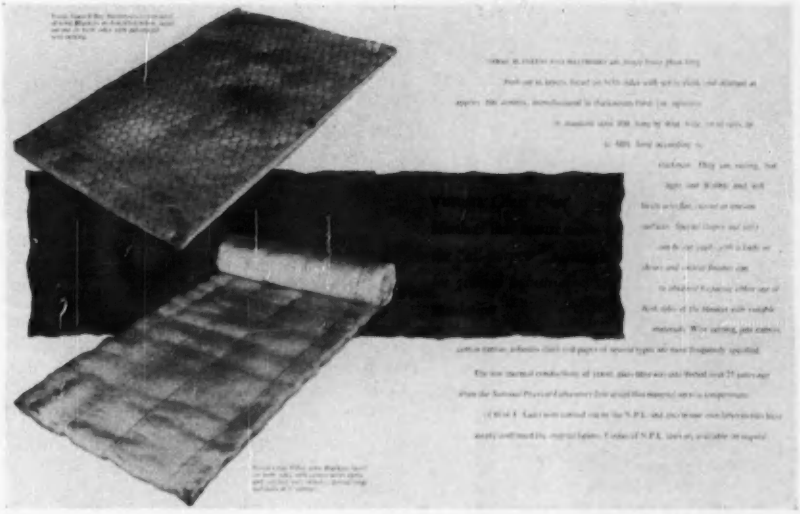


CHEMICAL & PETROLEUM ENGINEERING EXHIBITION
OLYMPIA 18 28 JUNE 1958

# NATTER, NATTER, NATTER...

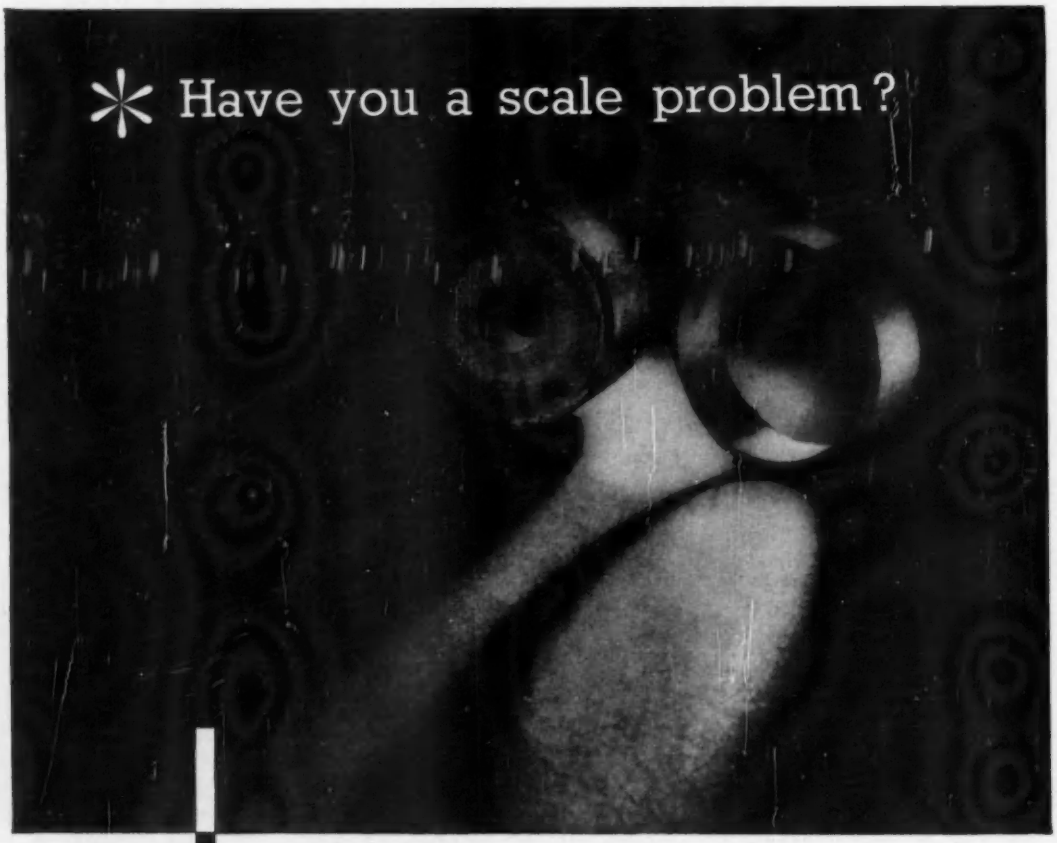
"*Silly old fossil*—does he think I eat the stuff or something ? What's the use of nattering on all the time about saving more fuel ? Doesn't he know that I've got the whole factory fuel-economy mad, that we're doing everything we can, that I've looked into everything that could possibly..."

But have you, Sir ? Have you looked into better insulation with VERSIL Glass Fibre ? If not, concealed heat losses may be the weak link in your armour. *VERSIL is so easy to install, to handle and to maintain. But above all, there is not a more efficient insulating material in the whole wide world.* Challenge us to prove it. Write to Versil Ltd., Rayner Mills, Liversedge, Yorkshire.



*Reproducd from a new Versil publication "THERMAL INSULATION"*

What You Need Is *Versil* THE GLASS FIBRE INSULATION




This dramatic illustration, an actual photograph of two pieces of copper piping cut from the same length, shows, on the left, how scale deposit restricts flow and consequent heat transfer and, on the right, how Starit treatment removes the obstructing matter, leaving the surface of the pipe unimpaired.

Scale deposits impose stresses in the metal and seriously reduce the heat transfer efficiency so vital for economical steam raising. Starit solution effectively removes most types of scale from boilers, feed pipes, heat exchangers, cooling systems and similar apparatus, cleaning those awkward corners beyond manual reach and leaving the metal in a first-class conducting state. The unique formulation of Starit ensures rapid attack on the scale whilst its action on the boiler plate is inhibited.

As there are certain rare cases where the scale is not susceptible to chemical attack, we invite you to send us a sample of scale, so that we can determine whether Starit should be used. We will also supply on request a booklet dealing with the application and limitation of Starit and the methods of using it.

STARIT TRADE MARK

STARIT

STARIT LIMITED
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# Mechanical Draught Fans

*Operate at . . .*

**89% *efficiency***

**over a wide range of applications**

**Our Engineers are ready to advise on the selection of fans to meet your requirements. For further particulars please write to our reference J/101/FGL.**

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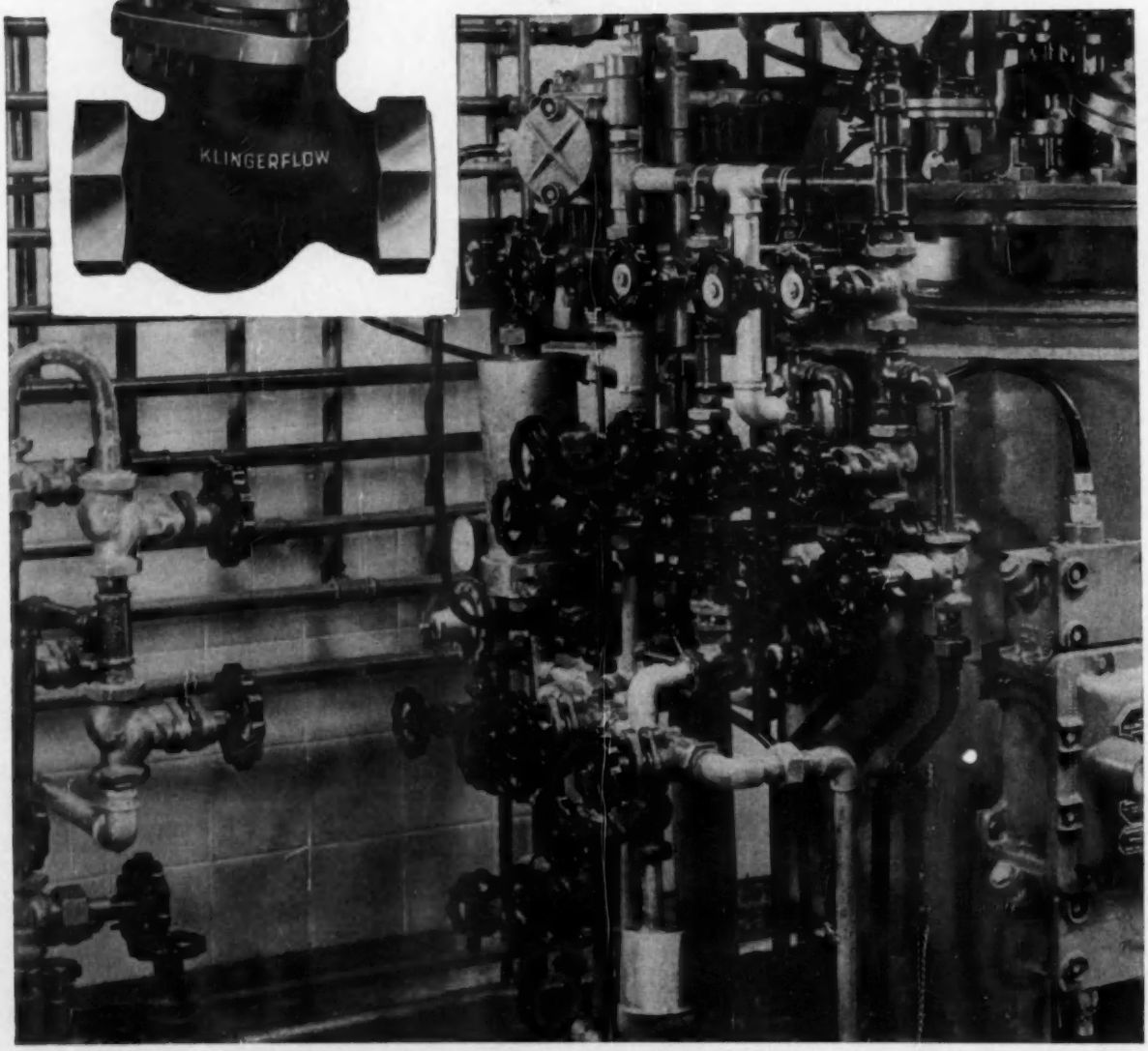
# *Klinger* PISTON TYPE VALVES



THE photograph shows a small part of the Fermentation plant at the Beecham Research Laboratories at Betchworth, where microbial substances are produced. All the valves visible in the picture and throughout the plant are Klinger Piston Valves. Klinger Sleeve-packed Cocks are also installed. The fluids controlled by valves include steam, hot and cold water, brine and compressed air.

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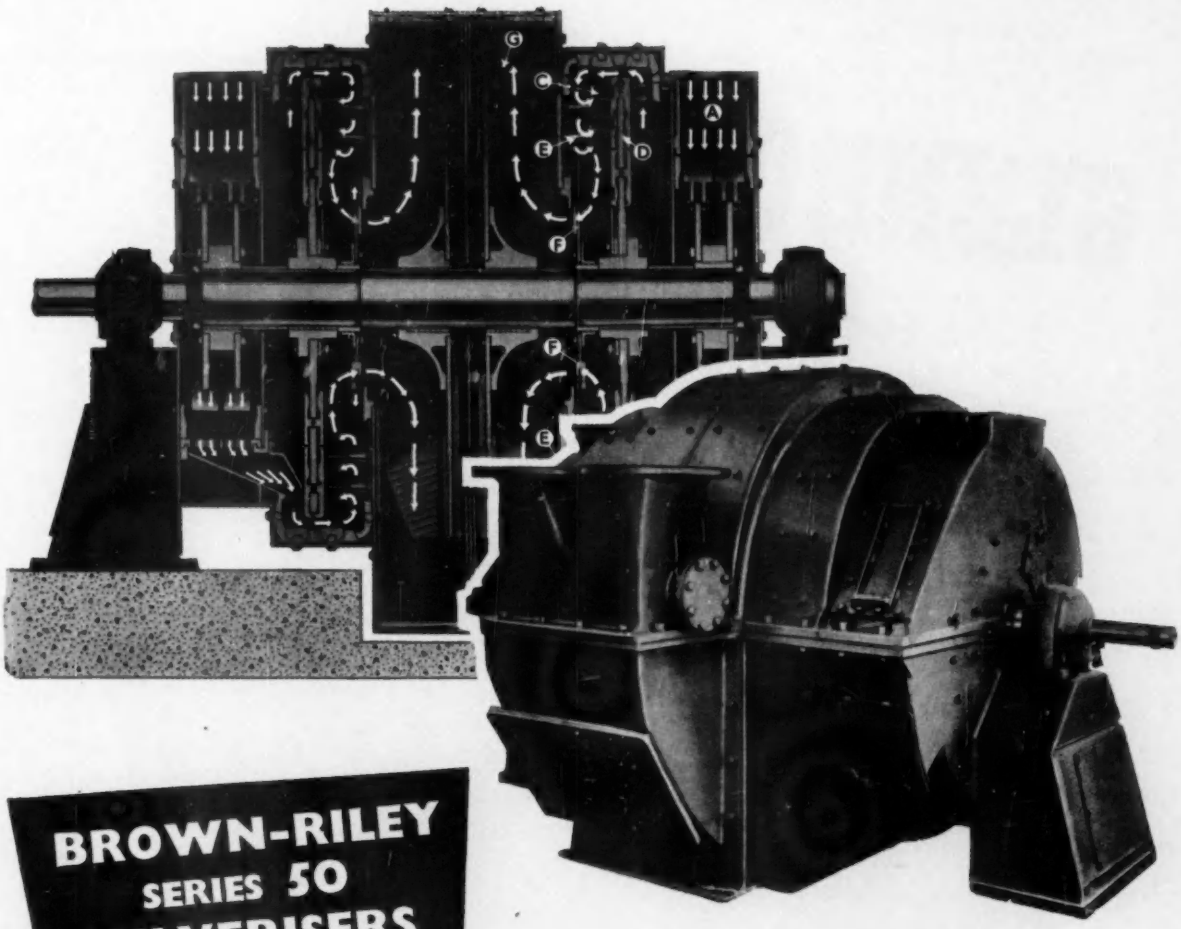


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Brown-Riley Series 50 Pulverisers are the result of some thirty years of development and research in the pulverising and firing of bituminous coals.

The use of Tungsten Carbide Pulverising Elements has increased their life enormously and the introduction of the preliminary crusher drier has enabled the through-put to be maintained even when handling high moisture coals.

After extensive trials some thirty-five of these Mills are now in production for the Country's Central Power Stations, and full technical details as to their application to other Industrial Boiler Plants are available upon request.


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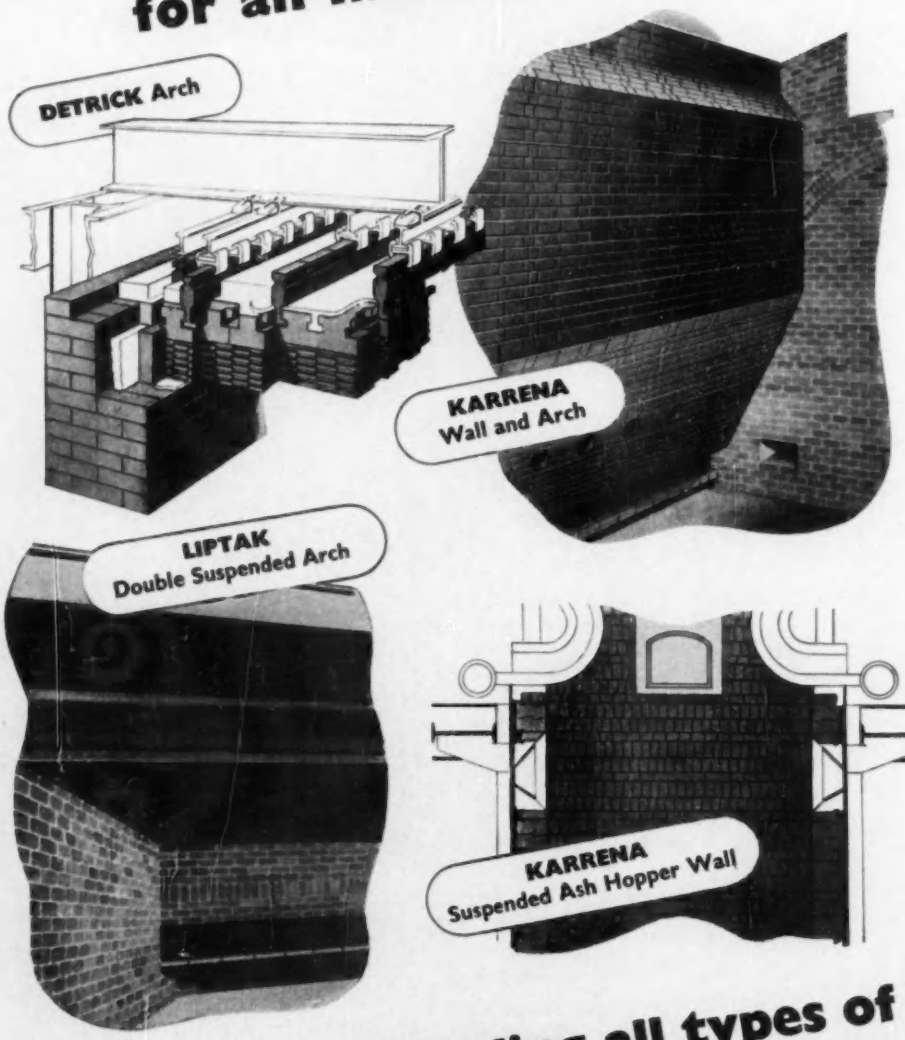


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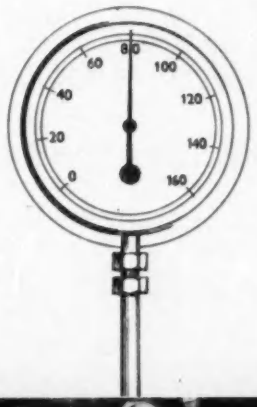
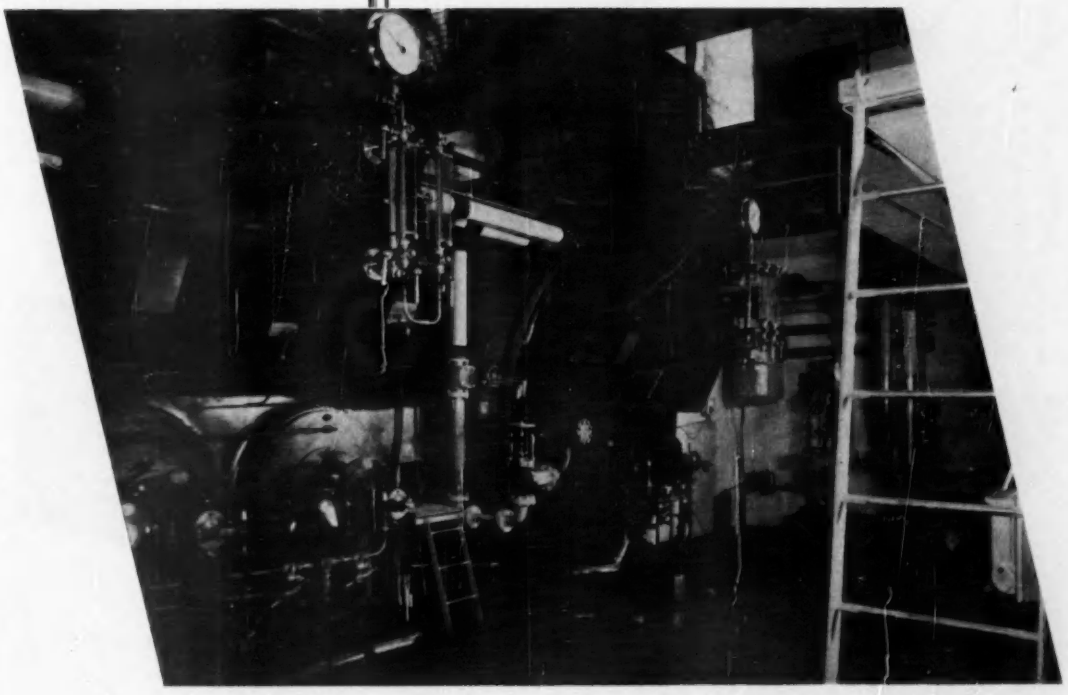



**Working at MAXIMUM EFFICIENCY!**



**Messrs. Pye Ltd., of Cambridge, ensure that their Thompson Economic Boilers are kept at their maximum efficiency by using D.M. Boiler Solution**

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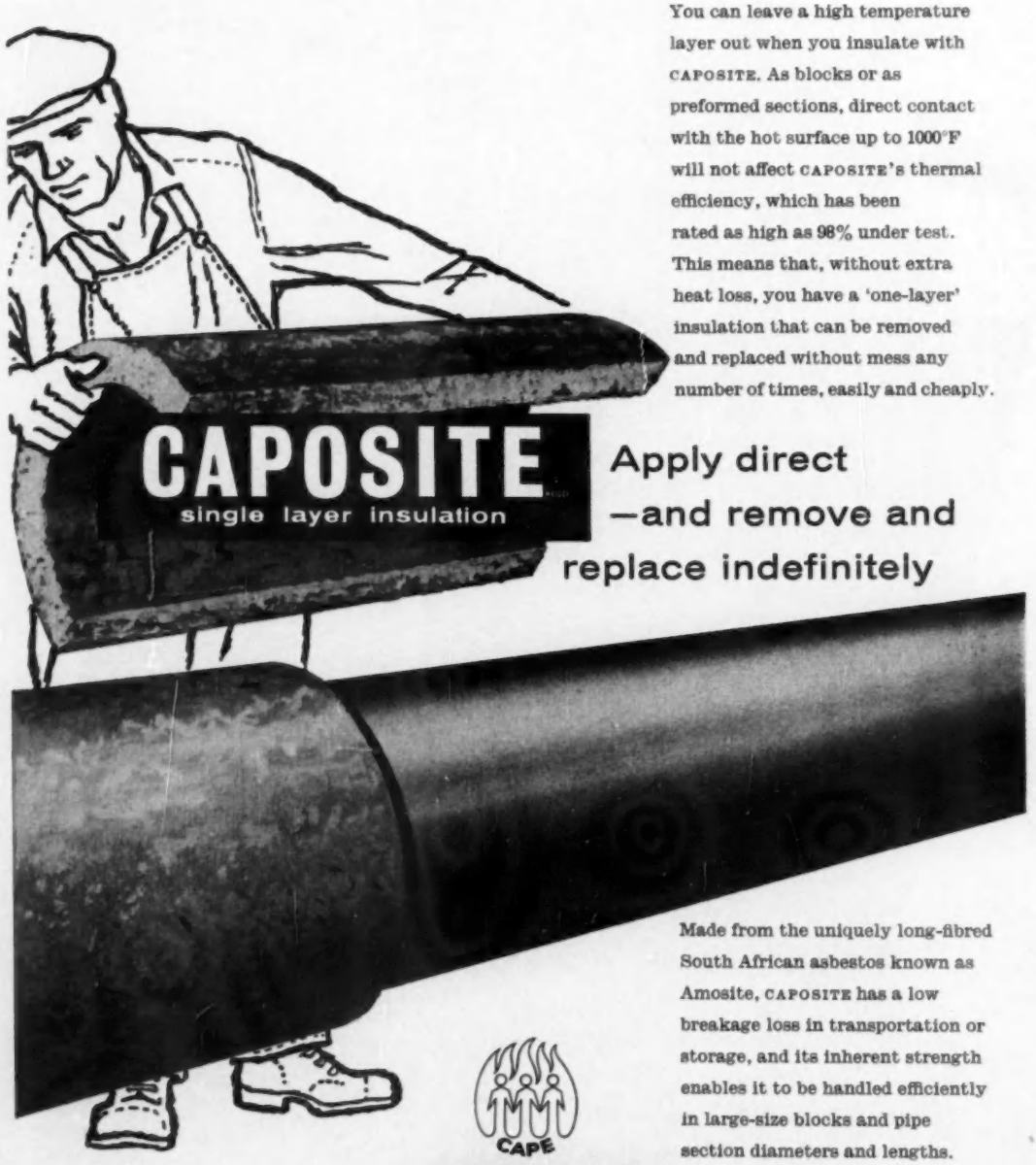


You can leave a high temperature layer out when you insulate with CAPOSITE. As blocks or as preformed sections, direct contact with the hot surface up to 1000°F will not affect CAPOSITE's thermal efficiency, which has been rated as high as 98% under test. This means that, without extra heat loss, you have a 'one-layer' insulation that can be removed and replaced without mess any number of times, easily and cheaply.

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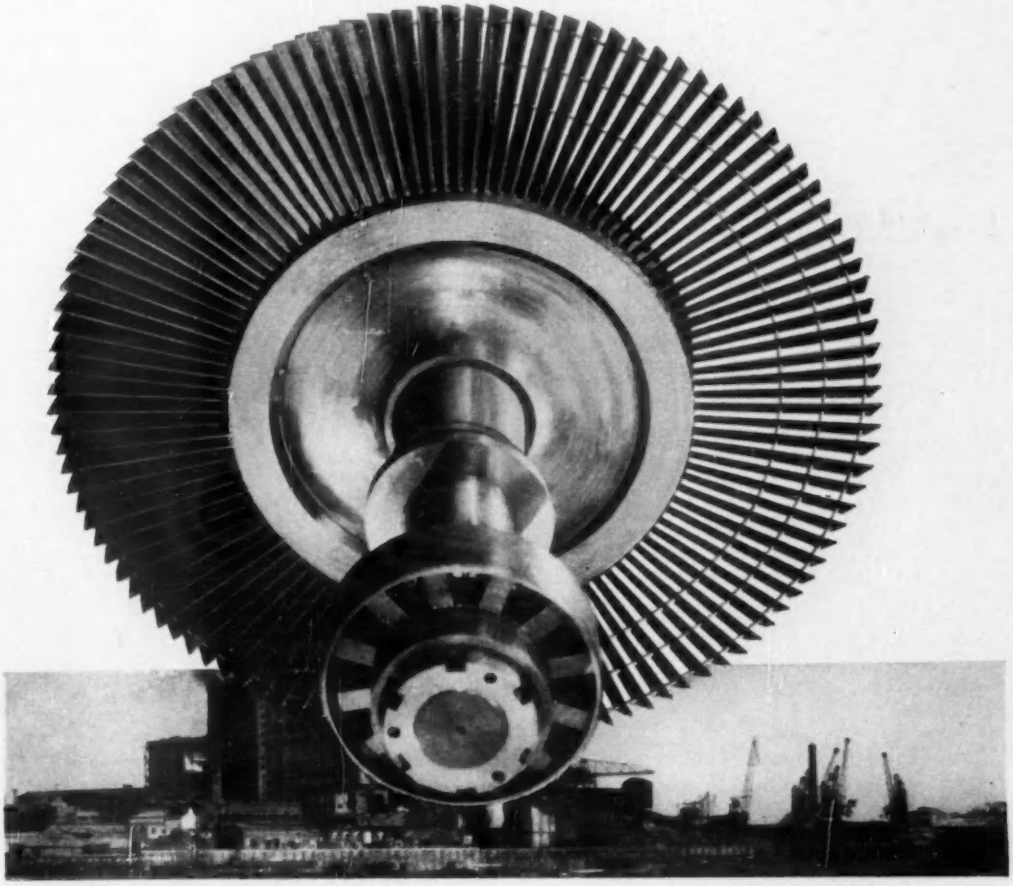

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The Cutty Sark is berthed within sight of the wharves of the Greenwich Insulation Company Ltd, whose skilled tradesmen throughout Britain specialise in the application of Thermal Insulation to chemical, oil, engineering, and all types of industrial plant. Like the Cutty Sark, the work of the Greenwich Insulation Company Ltd bears the stamp of craftsmanship and durability.

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The Clean Air Act provides, inter alia, that the density of smoke emitted from an industrial chimney must not be more than a certain density (Ringelmann 2) for more than two minutes. Black smoke is a sign of fuel being wasted—usually due to poor stoking. In these days of labour shortage, the most economical answer to the problem is to fit Crosthwaite Gravity Feed Stokers which allow the boilermakers' rating to be maintained without smoke and/or grit emission—and with maximum efficiency. Where maximum flexibility is required i.e. immediate response to a big demand for steam, fit the Crosthwaite Standard Mechanical Stoker with the Self-cleaning grate. The Clean Air Act need have no terrors for you if you consult Crosthwaite now—without obligation of course.

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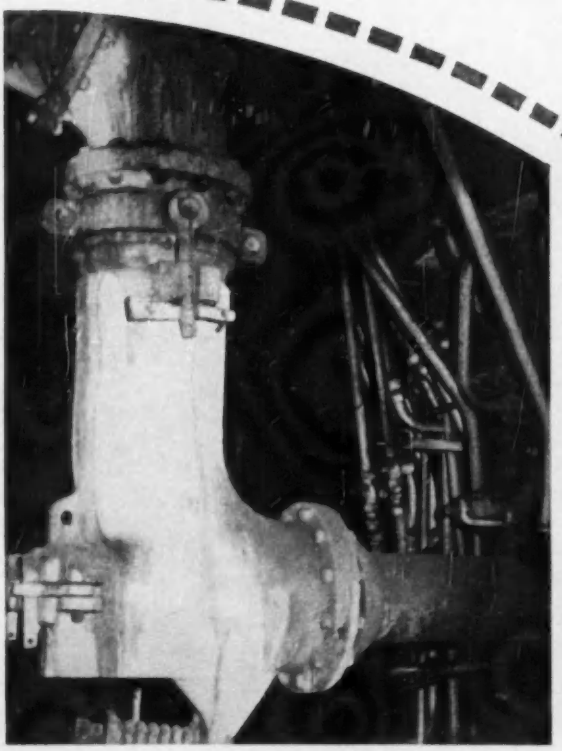
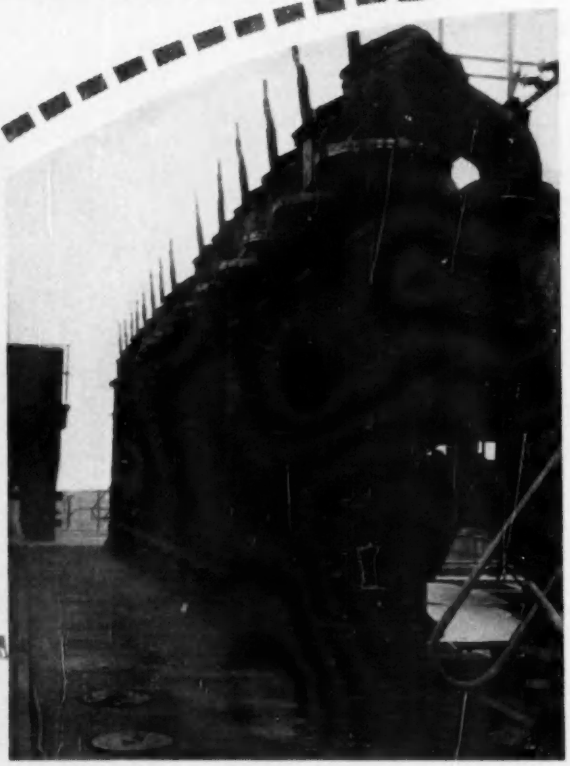
# PIPE LININGS

Examples of another of the many uses for

# REFRACTORY CONCRETE



*Refractory Concrete-lined Goose necks in position on blast furnace from bustle pipe to tuyere*



*A battery of refractory-concrete-lined ascension pipes in service.*

Not only because of its great economy and ease of placing, but, being completely non-spalling and highly resistant to scour, it forms a really lasting non-collapsible rigid lining for foul mains, ascension pipes, bustle pipes and similar hard duty applications.

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We will gladly forward on request a list of suppliers of crushed firebrick and other refractory and insulating aggregates, and of manufacturers of ready-prepared castable mixes incorporating CIMENT FONDU, to which only water need be added to make REFRACTORY CONCRETE.

*Coke oven ascension pipes showing Refractory Concrete lining.*

**REFRACTORY CONCRETE**
**the adaptable Refractory material made with crushed firebrick and CIMENT FONDU**

CIMENT FONDU
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*The Cement for Industry*

**FOR SPEED · STRENGTH RESISTANCE · REFRACTORINESS**

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*You are invited to write for further details and photographic examples*

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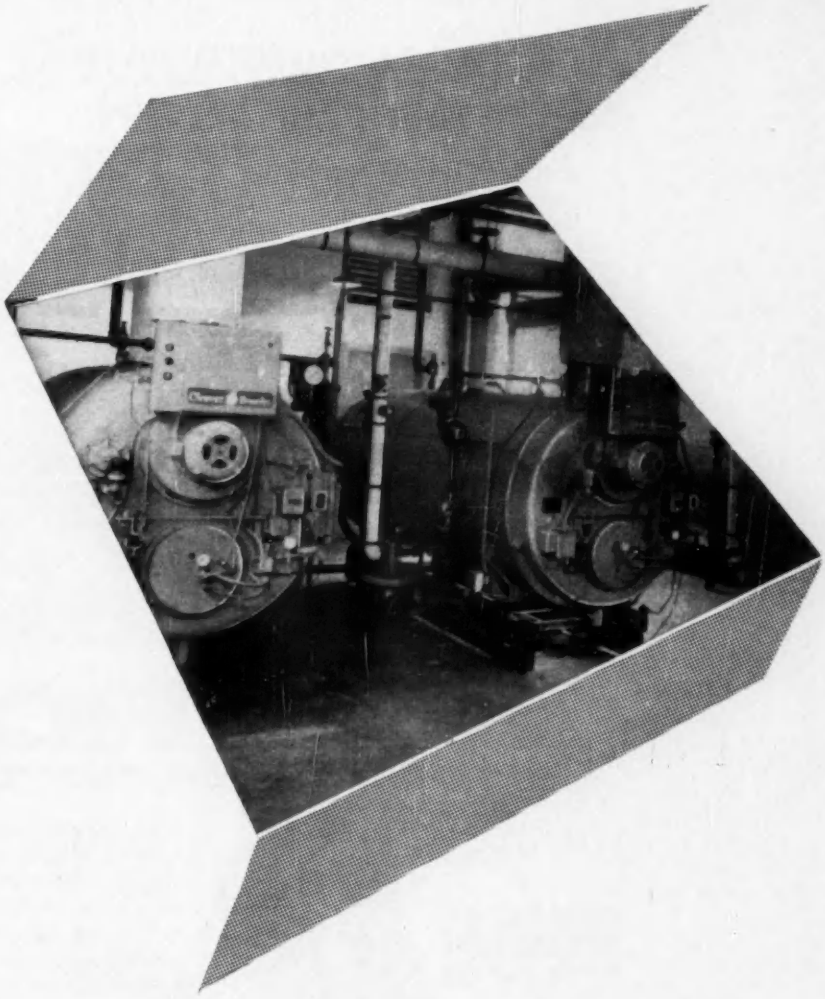

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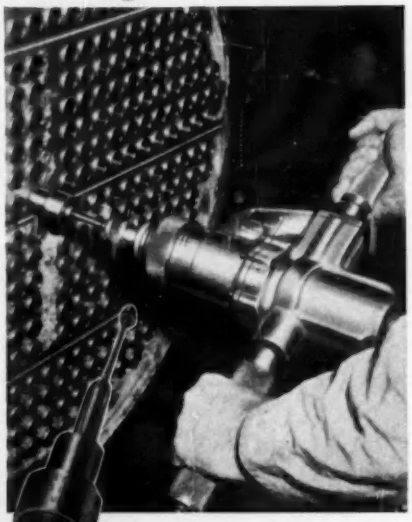

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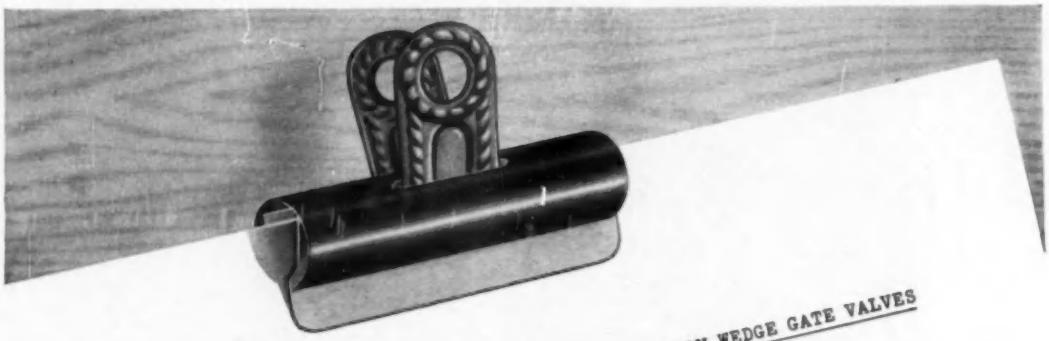
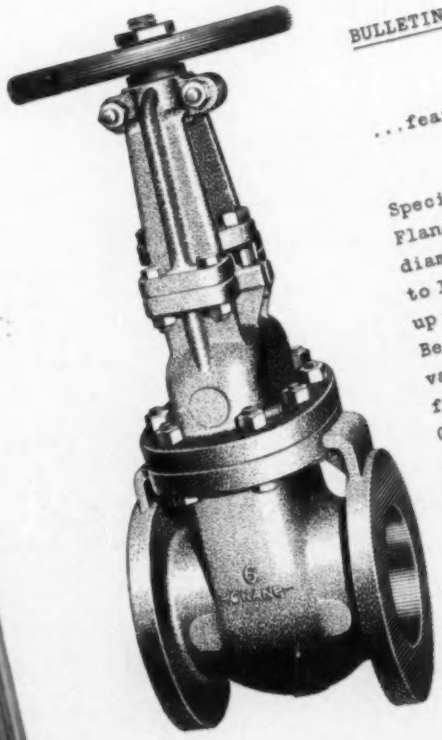


BULLETIN ON CRANE CAST IRON WEDGE GATE VALVES



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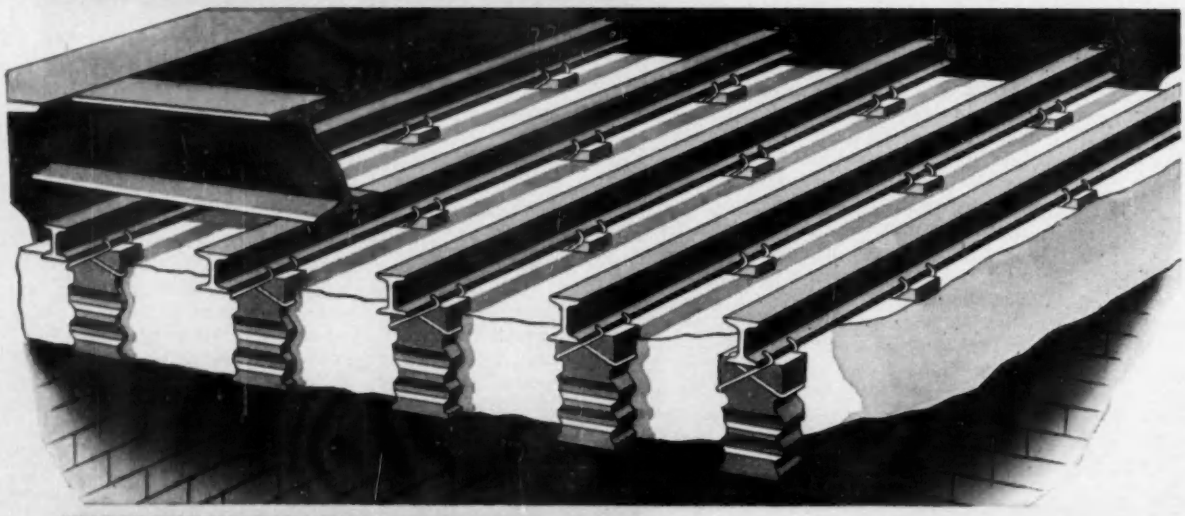

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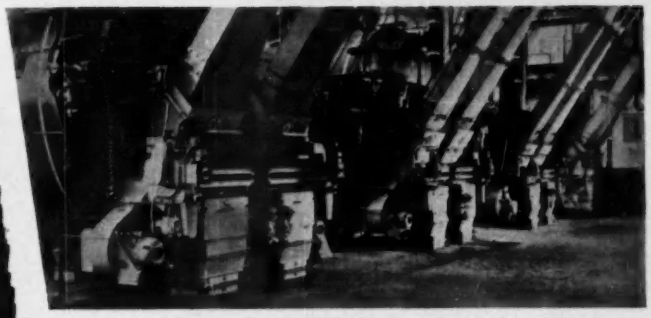
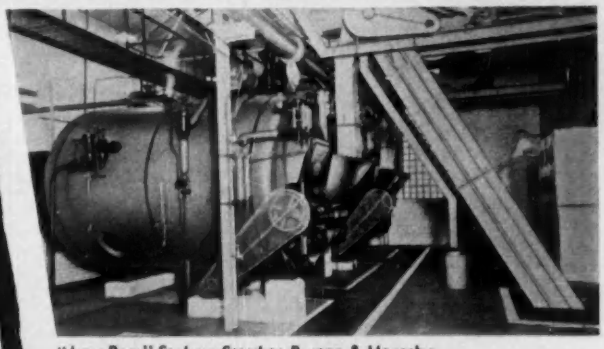


Bennis Chain Grate Stokers fitted to Economic boilers.



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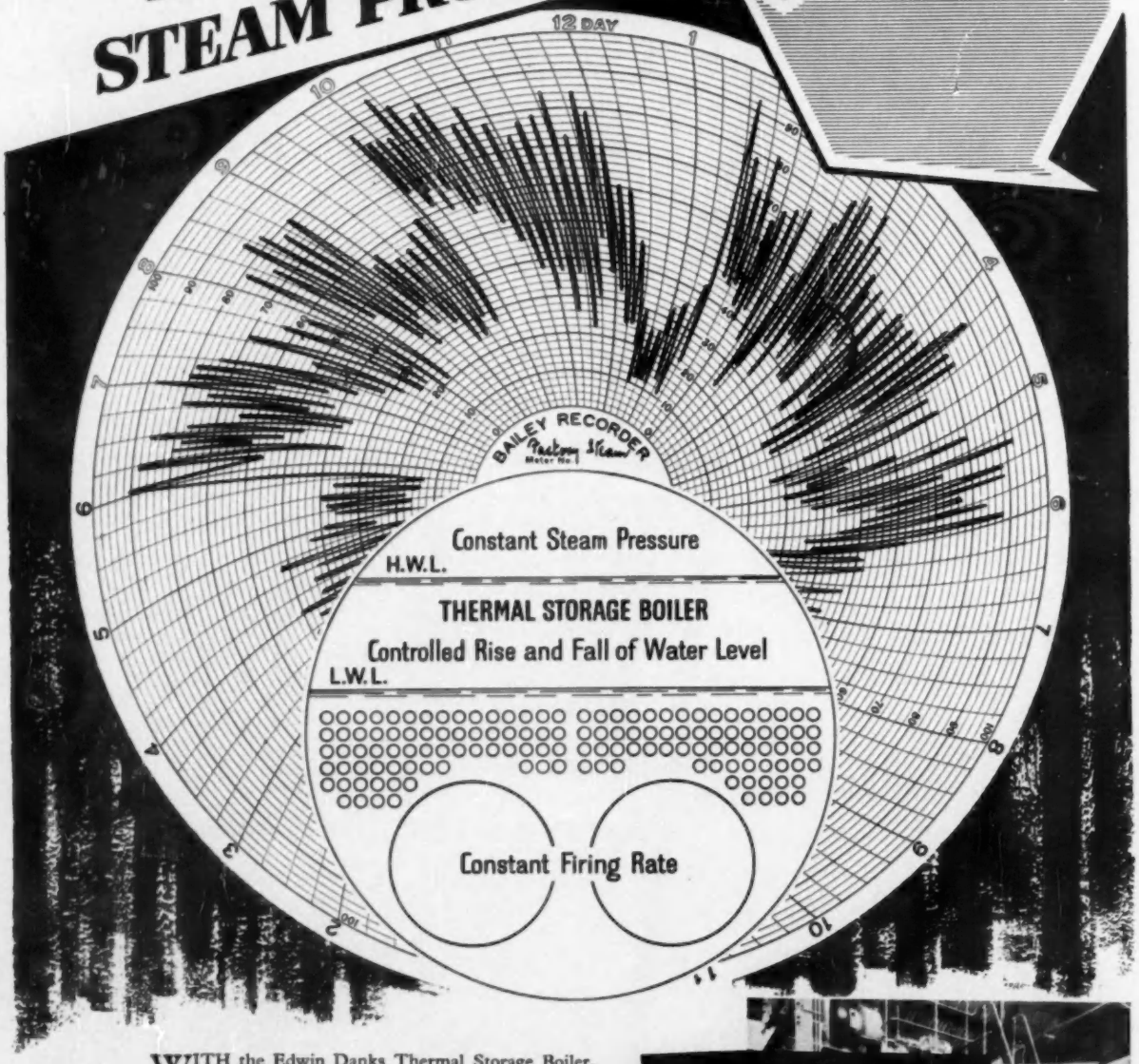
# IS THIS YOUR STEAM PROBLEM?

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# Engineering and BOILER HOUSE REVIEW

THE OLDEST ESTABLISHED STEAM ENGINEERING PUBLICATION

MAY 1958

VOLUME 73. No. 5


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*The Editor will be glad to receive and consider original contributions, correspondence, etc., of a suitable nature for publication. Stamped and addressed envelopes should be enclosed for the return of any matter considered unsuitable*


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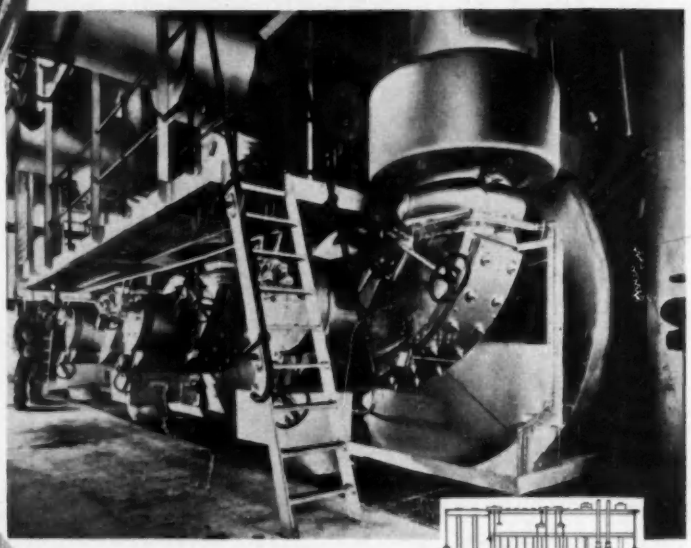
# BOILER No. 44



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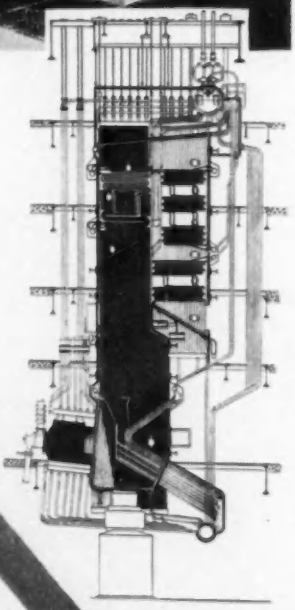

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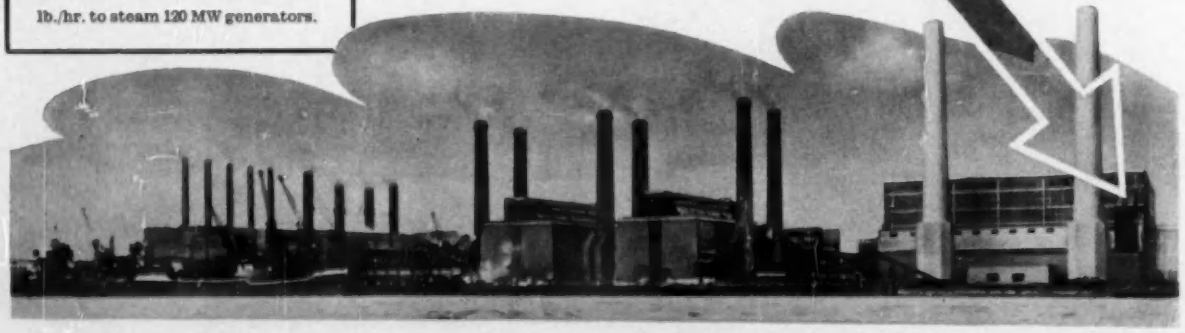
# BABCOCK *Cyclone-fired* BOILERS



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Engineering and
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MAY 1958

VOLUME 73 No. 5

## PRACTICAL TRAINING OF ENGINEERS

THERE has recently been issued by the Institution of Mechanical Engineers, a " Report on Practical Training " by a "Committee appointed by the Council ". The latter have reaffirmed the principle that a chartered mechanical engineer should have had practical training as well as academic education. It appears that this reaffirmation is directed mainly at research engineers, some of whom believe that as engineering becomes more scientific, there is a case for allowing a number of such engineers to avoid or dispense with practical training in the workshops. We agree that a research engineer in present day conditions is frequently nearer to being a scientist than an engineer.

It is, of course, a fact that the research engineer embarks upon his career when he is of comparatively early age, and commences work upon a somewhat crowded syllabus in a technical college and later in a university. After all this, he may quite naturally begrudge the idea of devoting any length of time to the question of practical training in the workshops. He is probably more concerned with commencing what might be termed " his apprenticeship to research." But the Institution's Council are quite firm in the decision that the aspiring chartered mechanical engineer must have practical training. The report stresses that part of this should be taught properly rather than acquired in a haphazard manner, and that the remaining part should be sufficiently flexible to be adaptable to the desires and needs of the young engineer involved. The chairman of the committee, Mr. H. G. Conway, and his twenty colleagues had the task in formulating the report, of specifying the nature and duration of practical training to be expected of those who take a full-time academic course in mechanical engineering.

The report condemns the traditional method of training in which the apprentice spends perhaps anything up to five years in various shops—largely learning and finding out for himself, but with no specialist instruction on the theory or the why and wherefore behind the various machining, fitting, erecting, or, in fact, any other processes.

It is, however, of interest to note that the committee envisages varying lengths of training periods in different departments for men intending to specialise later in life in manufacture, in design and development, in commercial departments, upon operation and maintenance and upon research. But whatever the final specialisation is to be, it is suggested that the actual period of practical training should extend over two years (as compared with the Council's present practice of accepting eighteen months in mechanical engineering workshops in industry as being sufficient) and that it should begin with a period of six months of basic training. This period of basic training would be followed by a period of secondary training during which the apprentice would work alongside craftsmen or tradesmen in the shops. Furthermore, the committee stress the principle that theoretical and practical training should be co-ordinated to ensure that the total training period is treated as an integrated whole. The order in which the practical and theoretical elements are arranged is not uniform throughout the country. In some cases it is recommended that young men proceed direct from school to university, deferring practical training until university studies for a first degree have been completed, though one or more vacation periods may be spent in industry. Others favour a sandwich course which includes six to twelve months of practical training between school and university, the balance being obtained after graduating. Still other colleges, especially those associated with the National Council for Technological Awards or Diplomas in Technology, prefer " works-based " sandwich schemes in which alternate periods of six months each are spent in industry and at college over a period of four or five years. All these schemes have certain merits. There are suggestions in the report, such as that concerning basic training that will probably prove controversial. Some people will ask—Do all professional engineers, as distinct from apprentices to skilled trades, really need to experience such basic training ? Is it absolutely necessary under present highly technical conditions that all of them shall acquire some degree of competence in using bench equipment and machine tools ? In any case they cannot hope, in the period of time available to acquire much skill. Engineering today is at least as much a science as an art. Basic training is probably essential for those who are destined to specialise in manufacture and possibly for those to be responsible for operation and maintenance. It is not so essential for those who are to specialise on the commercial side of engineering or to research.

The Conway Committee have rendered a valuable service to mechanical engineering, while the Institution of Mechanical Engineers, instead of accepting and adopting the report as expressing institution policy, has preferred to issue it to many people directly concerned with the subject, and to the Press, in the hope that further comment will be forthcoming.

# Points and Pointers

*PROFESSIONAL ENGINEERS' APPOINTMENTS BUREAU*

The Professional Engineers' Appointments Bureau recently issued a report summarising its work during 1957. It says that a steady demand for engineers of all grades was maintained during the year, although during the latter months some reduction in the numbers of vacancies notified became apparent. Enrolments of engineers with the Bureau showed no obvious fluctuations and were much the same as in 1956, although they were not as high as the two previous years, when approximately 2,000 enrolments were recorded. The numbers of engineers submitted last year to the notified vacancies were similar to 1956 but lower than in 1955. The Bureau says that last year placings have not been quite as high as in 1956, which was partly due to the decrease in junior placings, a predominant factor in former years. The number of names on the Bureau's register was comparatively constant throughout the year, enabling fair selections to be made for the majority of vacancies notified. In general, notified vacancies have covered most branches of engineering, many of them being located in areas overseas. Civil engineering, especially, the Bureau reports, has offered some interesting and well-paid posts abroad, whereas mechanical and electrical vacancies have tended to be for design, development and research engineers, based in the United Kingdom. Salary and location requirements insisted upon by individuals continued to be the major factors governing selection; few engineers enrolled with the Bureau without one or other of these restrictive conditions adversely affecting the choice of posts available. Another matter mentioned in the report is that last year there was a continued increase in the number of those over fifty years of age who enrolled, without there being any comparable increase in vacancies for which employers were prepared to consider this age group. The Bureau says its experience was that there appeared "to be virtually no change in the attitude of employers to consider older men." Any external influence, initiated by organisations interested in this difficult problem, seemed to make no difference whatsoever to improving the opportunities for these men. The Bureau draws attention to the recent change of address. The offices are now at 39, Victoria Street, S.W.1; the telephone number remains the same (ABBey 1737).

*MIDDLE EAST INDUSTRIAL PROJECTS CORPORATION*

The Federation of British Industries announces the formation of an international organisation called MIDEC S.A. "to further the development of industrial projects in the Middle East in conjunction with Arab and other local interests." Its registered office is in Luxembourg (Rue Aldringer No. 14) and it has branches in The Hague and Beirut. The present participating countries are Belgium, Canada, Denmark, France, Western Germany, Holland, Italy, Norway, the United Kingdom, Sweden, Switzerland and the United States. The total initial share capital of MIDEC S.A. is 1 million Swiss francs. The shares in MIDEC allotted to the United Kingdom have been taken up by a banking group; by a contracting group consisting of Balfour, Beatty & Co. Ltd. and Taylor Woodrow (Overseas) Ltd.; and a manufacturing group which includes Associated Electrical Industries Ltd., The British-American Tobacco Co. Ltd., the Dunlop Rubber Co. Ltd., the Guest Keen Iron & Steel Co. Ltd., Imperial Chemical Industries Ltd., Platt Bros. & Co. (Holdings) Ltd., the Power-Gas Corporation Ltd., Schweppes Ltd., and Standard Telephones & Cables Ltd.

*THE TENTH BRITISH ELECTRICAL POWER CONVENTION*

On Thursday, April 10th, Mr. W. S. Lewis, C.B.E., J.P., chairman of the Midlands Electricity Board, and of the British Electrical Development Association, presided at a Press conference, the purpose of which was to draw attention to the papers being read at the tenth British Electrical Power Convention to be held at Brighton from 16th to 20th June. The papers will deal with the development of nuclear energy for electricity supply in Great Britain and Overseas; Britain's part in electrical development Overseas; British hydro-electric plant and world power requirements; and the development of the electrically equipped kitchen. Introducing the convention president, Sir George Nelson, Bt., Mr. Lewis referred to the outstanding work which Sir George had done on behalf of his own company, the electrical industry, and industry generally. He was a past president of the Institution of Electrical Engineers and also of the Institution of Mechanical Engineers. Sir George Nelson, pointing out that the theme of this year's convention was "Electricity and World Progress—Britain's Contribution," spoke of the value of the convention as a means of bringing together leading representatives of the two great sections of the industry—manufacturing and electricity supply. The convention was conceived and encouraged by Lord Citrine to provide a forum for the exchange of views on the part which the industry could take in the social, economic and industrial life of the country—contributing towards the balance of payments and towards the efficiency of most other industries. Five papers were being read, and two of them would deal with nuclear power, a field in which this country had shown the way to the world. Mr. Lewis also welcomed Mr. C. R. King, C.B.E., deputy chairman, Central Electricity Generating Board, and vice-president of the convention. The convention which is representative of all the principal organisations—some forty in number—associated with the British electrical industry is, of course, a direct successor of the Incorporated Municipal Electrical Association's Convention, whose fifty-second and last meeting was held in Eastbourne in June 1948. This year's convention and the Convention Exhibition (which is to be held at the West Street Car Park) will, it is expected, bring to Brighton some 2,000 people from all parts of the country.

*A.E.I. RE-ORGANISATION*

In his statement, at the annual general meeting on April 9th, of Associated Electrical Industries Limited, the chairman, Lord Chandos dealt with some reorganisation within the company. The first stage, which involved the formation of four groups—B.T.H. (with the A.E.I. Lamp and Lighting Company, Birlec and Hill Top Foundry), Metropolitan-Vickers (with Ferguson Pailin and Sunvic), Siemens Edison Swan and the Overseas Group, has been completed, and the groups are "working smoothly and satisfactorily." The second stage, towards a change to a divisional organisation based on products, has just begun. Initially two A.E.I. divisions are being formed. The Turbine-Generator Division, which will be managed by Metropolitan-Vickers, and the Heavy Plant Division under B.T.H. These divisions will control the design, manufacture and sales of all products within these categories. Lord Chandos defined the ideal at which he and his colleagues are aiming as "a devolution of executive functions to subsidiary boards while maintaining a strong central control of industrial and financial policy." He emphasised the constant need to adapt organisation to changing conditions, and explained that the further reorganisation now begun was made necessary by the increasing size of their business, the hopes that it may double in ten years, and changes in the nature of the market for electrical apparatus. The divisional organisation is designed to eliminate duplication of effort and to make the best use of personnel. The order position of A.E.I. has improved considerably following a large influx of orders at the beginning of last year which has continued. The last to be announced is for the supply and construction of seven 132,000 volt substations in the Buenos Aires city area. The order, approaching £5 million in value, is the largest ever booked by A.E.I. for this type of equipment. Orders taken during 1957 totalled £177 million, over one-quarter more than the previous highest figure reached in 1956. The fact, announced for the first time by Lord Chandos, that only 10 per cent. of the total business is in consumer goods, suggests that there exists an underlying demand of great strength for electrical plant and machinery throughout the world. Another fact, also news, that A.E.I. have supplied 43 per cent. of the major generating plant commissioned by the C.E.A. during 1957, is another indication of their strength. Of the Authority's four steam power stations having the highest thermal efficiencies during the year ended March 31st, 1957, three had A.E.I. generating plant. More than 1,600 MW of A.E.I. major generating plant—the equivalent of 2.2 million h.p.—was commissioned during the year.

*INCORPORATED PLANT ENGINEERS*

The Eleventh Annual Conference of Incorporated Plant Engineers is to be held at the Grand Hotel, Brighton, from May 14th-16th. The theme of the conference will be "The Exploitation of Change" which will take account of present day requirements, and of the opportunities which now exist for the plant engineer to introduce improved techniques. In view of the large response to a similar invitation last year, the Council of the Institution is making the conference available to non-members by again inviting a limited number of industrial concerns to nominate staff to attend. Following the presidential address, two principal papers are to be presented and discussed. The speakers will be Mr. H. Birchall, B.Sc.(Tech.) (Engineering Director, Dyestuffs Division, Imperial Chemical Industries Limited), and Mr. L. Landon Goodman, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., who is a well-known authority on the subject of automation. Mr. Birchall's paper has as its subject "Some Current Techniques and Future Trends in the Planning and Operation of Process and Other Plants," whilst Mr. Landon Goodman will deal with automation and related subjects under the title of "Progress and the Plant Engineer." In addition, there are to be group discussions on the following papers :—"Cost Consciousness and the Engineer," by Mr. H. E. Betham, A.C.A. (Head of Management Planning and Control Section, Work Study Department, Unilever Limited), "Recent Trends in Production Control Methods and their Impact on the Engineer," by Mr. G. D. Jordan, M.Eng., A.M.I.Mech.E., M.I.Plant E. (Operational Research and Cybernetics Department, The United Steel Companies Limited; a Member of Council), and "Increased Mechanisation in the Building Industry," by Mr. C. H. S. Howkins, O.B.E., T.D., F.I. Plant E., Director and General Manager, Plant Division, Howard Farrow Limited; a Past President of the Institution. The conference dinner will be held on the Thursday evening when the principal speaker will be Engineer Rear-Admiral Sir Sydney Frew, K.B.E., C.B., M.Inst.F., M.I.Mar.E., Chief Fuel Engineer, Ministry of Power.

*B.E.A.M.A. ANNUAL REPORT*

The forty-seventh annual report of the British Electrical and Allied Manufacturers' Association, 36/38, Kingsway, London, W.C.2, was presented at the recently held annual general meeting of the association. The report deals at some length with the problems associated with the constitution of a free trade area in Western Europe. Pointing out that £5,104 million of the industry's total exports (18½ per cent.) went to O.E.E.C. and Rome Treaty countries, it comments that this indicates how deeply the industry is concerned with the European Free Trade area proposals now being considered by the Government. In the export field in general, the industry has exceeded its last year's record total of direct exports (£273 million) with a figure of £279 million. This represents approximately 22 per cent. of the industry's entire production. But Great Britain's share of the world's total export trade has fallen gradually from 28.1 per cent. in 1952 to 23.2 per cent. in 1957, whereas Western Germany has increased her share from 11.5 per cent. to 21.2 per cent. It is difficult to indicate the attitude of the electrical manufacturing industry to these proposals because the industry's interests and ramifications are so wide. Each section of the industry views the question differently, and has individual problems to solve. But it is fair to say that electrical manufacturers in general are opposed to the complete elimination of tariff barriers in the suggested span of fifteen years without the protection of effective safeguards against dumping and unfair competition. B.E.A.M.A. hope that an economical system of testing and proving, which includes the use of existing testing facilities (as in the B.S.I.-C.S.A. Approvals Scheme), will be established.

# MANVERS MAIN

## Carbonisation and By-product Plant

***The new coking plant of the National Coal Board at Manvers Main is designed to carbonise a million tons of coal per annum. The installation comprises a rebuilt and modernised plant, and a large new plant. There is also an extensive installation for the recovery of by-products. This reconstruction and development scheme has cost approximately £9 million to complete, and is the largest in the country.***

BY courtesy of the National Coal Board (North Eastern Division) we recently visited the very extensive coking and by-products plant at Manvers Main, Wath-on-Dearne, Yorkshire. The coking plant is the largest of its kind in the country, and is designed to carbonise 1,000,000-tons of coal a year :— the coal being drawn from the central preparation plant of the adjoining colliery. In addition to an annual production of 650,000-tons of blast-furnace, industrial and domestic coke, the plant will have an annual output of 50,000-tons of crude tar, 8,500-tons of ammonia products, 4,000-tons of concentrated ammonia liquor and 3½-million gallons of crude benzole ; as well as 19½-million cu. ft. of gas per day.

A minor scheme for the erection of some new coke ovens and the rebuilding of old ovens at Manvers Main began in 1949 and was followed by the £9-million major reconstruction and development scheme which is now virtually completed.

Carbonisation at a temperature of approximately 1,700 deg. F. converts coal to coke, gas, ammonia and tar. From the gas, is recovered crude benzole, ammonia and naphthalene, the residual gas then being used extensively for industrial and domestic purposes. The crude benzole is further refined and converted to a motor fuel with a high octane number, or into many pure products which are sold to the chemical industry where they form the basis of an immense range of commodities in use in everyday life. From benzole itself is derived a whole range of dyestuffs, insecticides, drugs and photographic chemicals. Nylon is one of the important new fabrics which is made from benzene. From other chemicals such as toluene and xyloles are derived a further range of dyestuffs and chemicals ; saccharine is made from toluole and synthetic perfumes from xylole. Again, from toluene is made the high explosive T.N.T. From xylole, such products as paints, lacquers, enamels and printing inks are produced. Some of the materials occurring in crude benzole and tar are present in quite small quantities, but nevertheless are used in a large variety of everyday materials ; thus, from pyridine is obtained the sulpha drugs which are used in the treatment of pneumonia. Naphthalene is extensively used in a large variety of industries and forms the basis of one of the synthetic plastic industries based on phthalic anhydride. Synthetic indigo and many other green and blue dyestuffs also start with naphthalene. Ammonia is used to make that very useful fertiliser, sulphate of ammonia, which is in increasing demand all over the world. From coal tar, by a series of processes, are obtained such materials as anthracene, which is the base of a series of bright-coloured vat dyestuffs ; phenol, which is used in synthetic resins of the bakelite type and as the starting material for the manufacture of aspirin, various disinfectants, perfumes and solvents. From coal tar are also obtained large quantities of road-making materials which are extensively used, fuels for steel smelting and re-heating furnaces, and the basic material (pitch) for the preparation of electrodes for the aluminium industry.

The benzole rectification plant at Manvers Main is one of the most modern in the country, and is designed to deal with 5 million gallons of crude benzole from Manvers and other N.C.B. plants within the Division. Purification plant is installed to treat the crude gas before it is supplied to the East Midlands Gas Board. The whole undertaking has been constructed on the most modern lines, incorporating the latest devices for carbonising, which is carried out under the most favourable conditions with the maximum prevention of atmospheric pollution.

The first coking plant at Manvers Main was a battery of 36 Koppers regenerative ovens built in 1906 ; and batteries of 14 and 22 Simon-Carves waste-heat ovens were built in 1912 and 1917 respectively. When it was decided in the 1930s to remodel the whole plant, 30 Simon-Carves rich gas underjet ovens and a new by-product plant were built on the site of the old waste-heat ovens. A further 15 Simon-Carves ovens were ordered in 1934, the existing coal and coke-handling plant and by-product plant having enough capacity to deal with this extension. When the National Coal Board took over the plant from private ownership it was decided to rebuild the batteries, and this work was carried out in stages in order to maintain gas supplies. The first stage was the building of 17 new Simon-Carves compound ovens : the 15-oven battery was then rebuilt, after which the 30-oven battery was remodelled as two blocks of 13 and 14 ovens respectively. This rebuilding was finished in 1953, and all the rebuilt ovens retained the rich gas heating system.

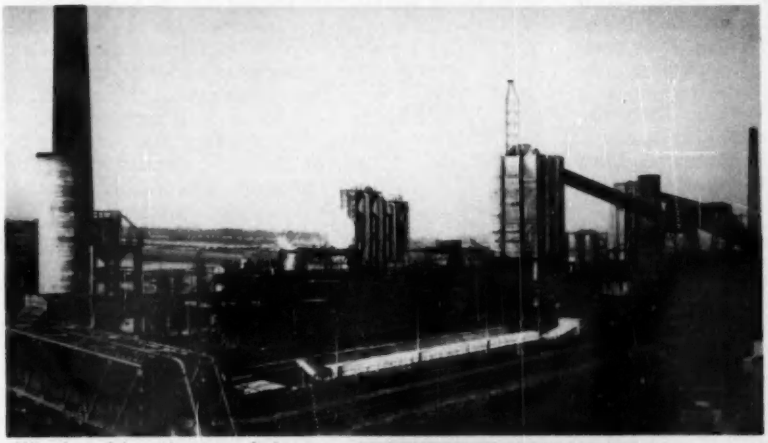
The colliery development scheme, which was being planned during the rebuilding of the ovens, called for a central coal preparation plant at Manvers Main to treat all the coal from Manvers, Wath, Kilnhurst and Barnburgh collieries—coal from the first three to be wound at Manvers and that from the last brought overland. As

the estimated output of saleable coal from this plant was 12,000-tons per day, including a large tonnage of coking smalls, and as the plant was well placed with respect to the gas grid, it was decided to increase the Manvers carbonising capacity to a throughput of 3,000-tons of coal per day, making Manvers Main the National Coal Board's largest coking centre. The coal preparation plant treats high, medium and low rank coals, three rows of blending bunkers enabling each type of coal to be kept separate and blended as required. As the old and new ovens have separate coal service bunkers and coke wharves, the coke from the two sites can be kept separate, thus enabling two types of coke to be separately produced, stocked and handled.

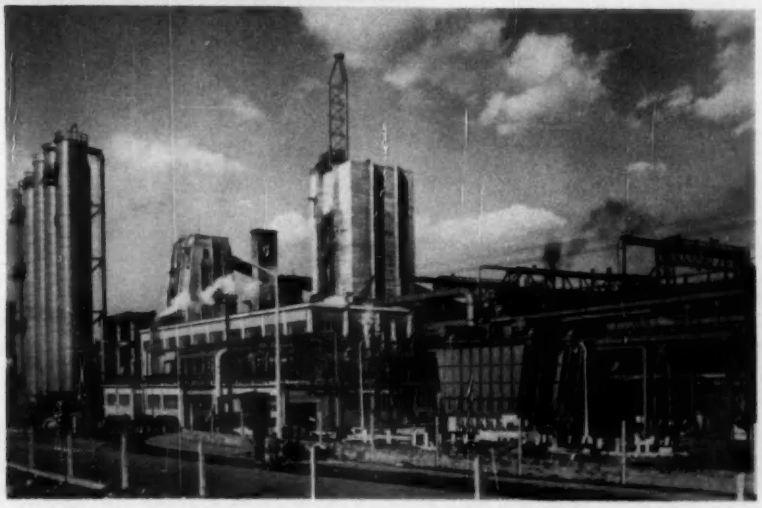
It was decided that this large installation justified its own self-contained boiler and power generating plant. Steam at 625 lb./sq. in. and 815 deg. F. passes to back-pressure turbo-alternators and is exhausted at 160 lb./sq. in. to the prime movers of the coke-oven plant and certain other sections of the colliery. When the new plant was being planned, the extension of the old site of the coke-oven batteries was limited by the need to retain the original small oven dimensions of 38-ft. 6-in. over the sole, 13-ft. 3-in. high and 1-ft. 6-in. mean width, giving a weight of 14-tons as charged. To the rebuilt ovens listed above, there has been added a block of 12 new compound ovens, and the completed battery gives a throughput of about 1,320-tons of coal per day. A new chimney was built to serve all the 71 ovens on the old site. On a new site there has been built a battery of 66 ovens in two blocks of 33. These ovens have chambers 44-ft. 7-in. long over the sole, 14-ft. 9-in. high, 1-ft. $5\frac{3}{4}$-in. mean width, and they each take a weight of 17.8-tons as charged. This battery has a throughput of 1,570-tons per day.

In order to save ground space, the ram-track of this battery is carried about 19-ft. above ground level, the space below being enclosed by brick walls to provide locker-rooms, shower-rooms, mess-rooms, workshops and an electricity substation. It has two complete sets of oven machinery and the travel-motors of the ram-machines have "Microsen" gear, which enables the machines to be centred quickly and smoothly. The ram-beam can be operated at reduced speed by a compressed-air motor in case of power failure. The coke guides and coke side door extractors are separate machines with their own travel drives. Charger cars of portal frame design have their travelling wheels mounted in bogies, the bogie frames being riveted to the chassis on one side and mounted on the other side carried by pin bearings with hydraulic dampers. The three-point suspension thus provided evens out the load and prevents "crabbing" and vibration, which greatly reduces wear and tear on the oven top brickwork.

The plant is fitted with self-sealing doors throughout, the new 66 oven battery and three of the batteries on the old site having a new type of latch gear. This door, known as the "G" type, is tightened on to its seating by its own weight instead of by the



*(Above). Coke side view of the new sixty-six oven battery which is arranged in two blocks of thirty-three and has a throughput of 1,570 tons per day*



*(Right). New by-product plant, showing (left) benzole scrubbers and coolers, (centre) exhauster and booster house, and (in foreground) oil regeneration unit and naphthalene washers.*

conventional rose and screw. Two toggle arms pivoted to the door body engage with the latch hooks, and the weight of the door acting through the toggle arms forces the sealing strip on to its seating. To remove the door the extractor head takes the weight in the normal manner, and the toggle arms are then raised until the latch bars are clear of the hooks by handwheel operation of a screw-jack in the linkage between the arms; the door is then withdrawn in the usual way. This "G" type of door has the advantage that the closing force is constant, and strain on the latch hooks and sealing strips is avoided.

**Coke handling and screening**

The batteries on the old and new sites have separate conveying systems to the main coke screen house, so that different types of coke can be kept separate if necessary. The wharf conveyors from the old and new sites meet at a junction tower, from which two conveyors cross the main railway line in a single gantry to another junction tower on the far side. From this tower two further conveyors lead to the main reinforced-concrete screen house, where each conveyor feeds its own line of grizzley screens for run-of-oven coke. Overs from the grizzley screens may be delivered, either to rail wagons by loom loaders or to the stocking ground. Throughs (under 2½-in.) may be fed either to secondary screens or to the stocking ground. A proportioning device enables some or all of the run-of-oven coke to bypass the grizzley screens and to be fed through a cutter to the secondary screens or to the stocking ground. The secondary screens are fed from a hopper distributing to three double-deck vibrating screens, the throughs of which are conveyed to a second-stage comprising three more double-deck screens. Graded coke is conveyed to domestic bunkers with five 30-ton compartments for coke breeze and four sizes of nuts. These bunkers deliver graded coke either by vibrating feeders and de-breezing screens to rail wagons, or by conveyor to the stocking ground or the boiler house hoppers. The boiler house conveyor can also receive coal from the washery. Run-of-oven or screened coke can be handled in and out of stock at 200-tons per hour. Coke for "stocking-out" is conveyed to the feed hopper of an aerial ropeway system, and alongside the delivery conveyor is a reclaiming conveyor fed from the ropeway through a buffer hopper.

In the main screen house there is a control desk with a mimic panel consisting of a geographic line diagram of the whole coke-handling and screening plant, with indicator lights to show the actual flow of coke. The required flows are chosen by selector switches and brought into operation by push buttons on the control desk.

**By-product plant**

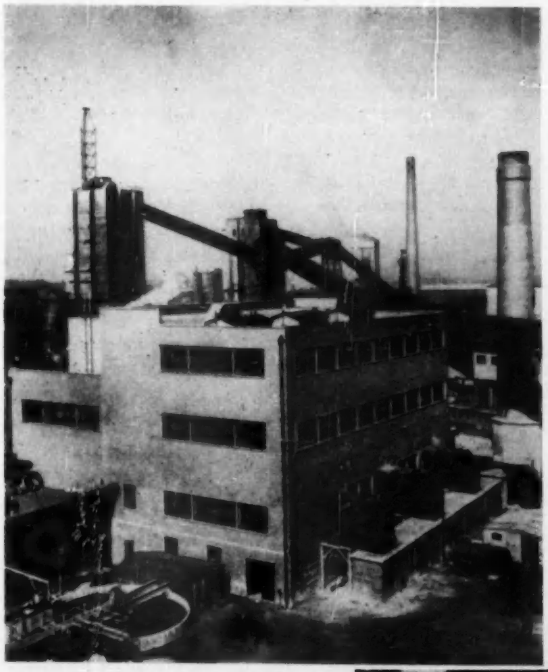
Owing to lack of space on the old site, a new by-product plant was built on the new site to handle the gas from the new 66-oven battery and from the rebuilt 13- and 14-oven batteries on the old site, the foul-gas mains from the two later joining the foul-gas mains of the 66-oven battery at the inlet to the primary condensers. The new by-product plant thus receives the gas from the carbonisation of about 2,000-tons of coal per day, leaving the old by-product plant to handle a slightly lower gas volume than before. The old plant comprises primary condensers, exhausters, detarrer, ammonia scrubbers and benzole scrubbers; gas for heating the ovens on the old site is taken from the outlet of the benzole scrubbers via two Askania governors. Surplus gas enters the outlet main of the new by-product plant. Liquor from the ammonia scrubbers is worked up in a concentrated ammonia liquor plant built on the new site by Chemical Engineering Wiltons Ltd., a subsidiary company of Simon-Carves Ltd.

The new by-product plant is generally of orthodox design and comprises primary condensers, exhausters, detarrers, semi-direct saturators, direct secondary coolers and benzole scrubbers. At the point where gas from the old site is received, an existing gasholder is connected to the main to act as a balance holder. This main divides into two branches, one of which delivers heating gas to the 66-oven battery via an Askania governor while the other delivers surplus gas to the final naphthalene washers. From the outlet of these washers the gas is again divided: about 4 million cu. ft. per day is pumped unpurified to Swinton and Mexborough for the Gas Board; the remainder is boosted through tower purifiers and returned to the compressors which deliver to the gas grid. A 750,000 cu. ft. gasholder acts as a balance holder on the outlet of the purifiers. Provision is made for dilution of all surplus gas by producer gas, but the products are not yet installed.

*General view of benzole refinery before the sixth fractionating column was erected.*

There are five vertical water-tube condensers (one spare) working in parallel, with provision for a sixth, and two turbo-exhausters (one spare) driven by back-pressure steam turbines. The detarrers are of standard Simon-Carves tube type with riveted shells. The four compressors which deliver to the gas grid are installed in a compressor house with space for two more and each has a capacity of 6 million cu. ft. per day. Of the four existing machines one is steam-driven, one electrically-driven, and two dual-driven—the electric motors being

housed in a separate motor room with drives through gas-tight glands in the wall ; this driving arrangement enables varying gas loads to be handled with economy of steam and electricity and without need for using variable-speed motors. The compressed gas is cooled in indirect after-coolers from which it passes straight to the grid. The unpurified gas supply to Swinton and Mexborough is taken off the inlet to the purifier boosters and passed through a Connersville meter to either of the two compressors of 4 million cu. ft. per day capacity ; one compressor has electric drive and the other dual drive, the motors being housed in the same motor room as those of the purifier gas compressors. Two indirect after-coolers are provided. The crude benzole from the whole plant is recovered in three stills located on the old site with their oil-heaters, columns, coolers and naphthalene trays. The crude spirit is pumped to storage tanks of a new refinery. This refinery can handle 15,000 gallons of crude spirit per day which represents the whole of the crude produced at Manvers, together with a million gallons a year of crude from other works.

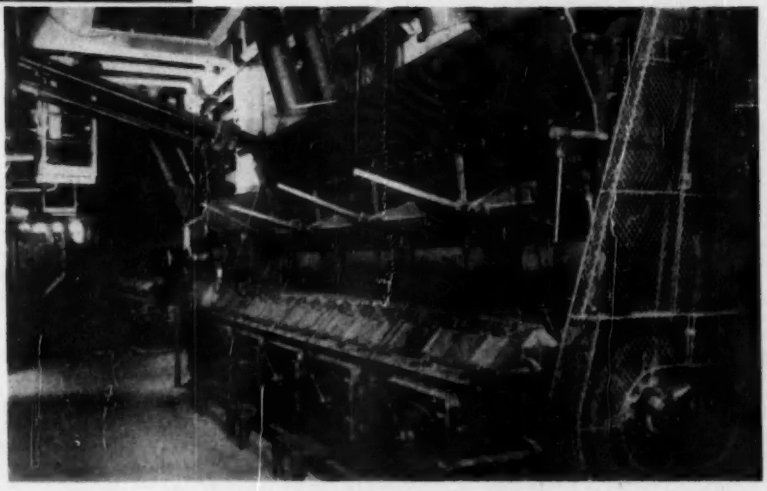


*(Above). Power house, also showing water treatment plant.*

The process steam supply to the benzole refinery is arranged for maximum economy in operation. Steam at 140-150 lb./sq. in. and 500 deg. F. is received from the back-pressure turbines in the power station and passes through a de-superheater before entering the heating coils of the stills. Low-pressure steam at 15 lb./sq. in. is delivered from the exhausts of the reflux and circulating pumps on the plant and is used as direct steam in the defronting columns and acid regeneration plant ; it is also used in a special heater which heats the condensate used in the anti-freeze coils in the pure benzene tanks. Any surplus condensate is added to the clean water circulation system which supplies the condensers via a water cooling tower. Crude benzole is defronted, washed with once-used acid, and then distilled in the primary stills. These produce either motor spirit or semi-pure products : motor spirit is run to storage tanks, while the semi-pure products are washed again with strong acid before re-distillation in the secondary stills. The columns work on the pumped reflux system and are designed to make a wide range of products ; for example, three grades of pure benzene of different specifications are normally made, together with toluene, xylene and solvent naphthas. The plant is fully instrumented, and controllers are used wherever appropriate to regulate the stills and columns. Provision is made for heating the pipe trenches of the benzene lines to prevent solidification in cold weather.

**Steam and power generating plant**

The main contractors for the steam and power plant were Simon-Carves Ltd.—the plant comprising three boilers, water-treatment plant, fuel and ash-handling plant, two back-pressure turbo-alternator units, electrical equipment, and all civil engineering and building work. The three Simon-Carves tri-drum boilers are of the twin-circulation type, with water-cooled combustion chambers. Each boiler has a c.m.r. of 60,000 lb./hr., and



*(Right). Firing aisle in boiler house showing fronts of the two 70,000 lb./hr. Simon-Carves boilers fired by L-type stokers supplied by International Combustion Products Ltd.*

a continuous peak load of 70,000 lb./hr. The working pressure is 625 lb./sq. in., and final steam temperature 815 deg. F., the feedwater temperature at the economiser inlet being 220 deg. F.

Fuel is fed to the bunkers from a conveyor which is complete with automatic travelling tripper, and can handle coal and coke breeze at the rates of 125 and 75 tons per hour respectively. The travelling tripper is fully-automatic and is capable of travelling or remaining stationary whilst delivering fuel to the bunkers. The tripper is complete with a two-way chute and diverting gate to enable coal or coke to be delivered to their respective bunkers. Each boiler is complete with superheater and non-contact type desuperheater, economiser, sootblowers, draught equipment, grit-collector, mechanical stoker, two gas-burners in each side wall, instrumentation and automatic control equipment.

The boilers are designed for firing with the following fuels :— sandwich firing of coal and coke, coal, coke-oven gas and provision for future firing with coal and tar fuel. Each superheater is of the two-pass controlled pendent type. The de-superheater forms an integral part of the superheater and consists of a number of coils submerged below the water-level in the front steam drum. The final steam temperature is automatically controlled. One forced-draught fan is provided for each boiler and two induced-draught fans for the three boilers. One induced-draught fan is capable of handling the gases from two boilers. One secondary-air fan is also installed per boiler to provide air to the nozzles in the front arch of each stoker. One multivortex type grit-collector and booster fan is installed between each boiler and the i.d. fan. All the fans and the grit collectors were supplied by James Howden & Co. Ltd. The L-type stokers supplied by International Combustion Products Ltd., are of the single-grate type, each driven through a self-contained gear by a variable-speed motor. Each stoker is fed by two coal and two coke traversing-type chutes from the overhead fuel bunkers. The outlet from each i.d. fan is connected to a main flue which discharges into a brick chimney 8-ft. i.d. by 120-ft. high.

**Ash-handling plant**

The ash from each stoker ash-hopper discharges into a submerged ash-conveyor in the boiler house basement. From this conveyor the ash passes on to a rubber belt conveyor and is discharged into a reinforced-concrete ash-bunker from which it is removed for disposal by lorries. The grits collected in the hopper adjacent to the water drum pass to the stoker ash-hopper, while those collected in the hoppers below the economiser and grit-collector are delivered on to a Redler conveyor, which in turn transfers the grit to a second Redler conveyor for discharge into the submerged ash conveyor.

**Water treatment plant**

The water treatment plant supplied by William Boby Ltd. provides 12,000 galls. of treated water to the boiler plant. In addition 33,000 gal./hr. of filtered water and 2,000 gal./hr. of soft water are supplied to the coke-oven plant. The water first passes through the flocculation and sedimentation plant, then through the filtration plant (the gross output being 50,000 gal./hr.). Six pressure-type filters are installed, five being capable of filtering the gross output. One ammonia removal plant capable of handling 14,100 gallons per hour is installed. The base-exchange plant has a capacity of 14,100 gal./hr. and is capable of treating raw water having a total hardness of 400 p.p.m. and giving an effluent of zero hardness. A condensate de-oiler is provided for the elimination of oil from any available condensate. The plant has a peak capacity of 30,000 lb./hr. and a continuous rating of 20,000 lb./hr. It is complete with filtered water pumps, booster pumps to deliver the filtered water to the base-exchange units and the two soft-water storage tanks. Four triple-effect " P & B " evaporators of the thermo-compression type, supplied by Aiton & Co. Ltd., are installed. The total output of each unit is 32,380 lb./hr., the water leaving the plant at a temperature of 200/210 deg. F. One de-aerator, supplied by Wm. Boby & Co. Ltd., and of 140,000 lb./hr. capacity is installed. The oxygen content of the water leaving the de-aerator is 0.01 c.c./litre, and the temperature 220 deg. F.

**Feed pumps**

Two steam-turbine-driven pumps and one electrically-driven pump are installed. These were supplied by Mather & Platt Ltd., each pump having an output of 150,000 lb./hr. with water inlet temperature 220 deg. F. The steam-turbine-driven pump automatically starts-up in the event of the feed line pressure falling below a predetermined figure. The steam pressure reducing and de-superheating equipment comprises two automatic electrically-operated steam reducing valves to reduce the steam pressure from 650 to 160 lb./sq. in. (one valve has a capacity of 130,000 lb./hr. and the other a capacity of 20,000 lb./hr.), and two spray type de-superheaters with automatic control, each capable of de-superheating 130,000 lb./hr. of steam at 160 lb./sq. in. from 795 to 550 deg. F. The pressure reducing valves and de-superheaters are used when the turbo-alternators are shut down.

Each boiler is provided with its own instrument and control panel which is equipped with all necessary integrating and recording instruments, remote control for fan and stoker motors, and superheat temperature control. The panels, instruments and automatic control equipment was supplied by Bailey Meters & Controls Ltd.

The two 3,850-kW turbo-alternators (the turbines being back-pressure machines) were made by C. A. Parsons & Co. Ltd. Steam conditions at the turbine inlet are 625 lb./sq. in., and 815 deg. F., and it is exhausted at 160 lb./sq. in. to the prime movers of the coke-oven plant, and certain other equipment at the adjacent colliery.

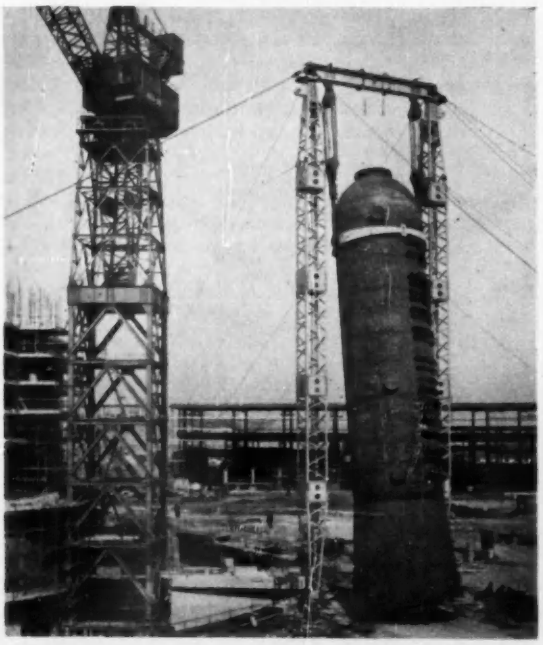
The construction of the complete Manvers plant presented a number of special problems, many of which arose from the necessity to maintain uninterrupted gas supplies to the Gas Board under existing commitments. This was achieved by careful planning of the starting and finishing dates of every stage of the work, but complications were caused by the fact that reconstruction of the existing oven batteries had been begun before the extension was settled. The new battery of 17 compound ovens on the old site was built in order to maintain gas output during the successive reconstructions of the various existing ovens, and a bridge was used to span the 15-oven battery, and later the 13-oven and 14-oven blocks of the old 30-oven battery, so that the charger car could continue to draw coal from the service bunker

throughout the progress of the work. The railway lines traversing the site introduced other difficulties. Gas mains and conveyors had to cross tracks on bridges, and the erection of these bridges without interrupting traffic called for exact planning and close co-operation with the railway staff. It is tribute to the engineering staffs of British Railways, of Simon-Carves Ltd., and of the sub-contractors that these operations were completed without a single mishap.

Simon-Carves Ltd., Cheadle Heath, Stockport, were the main contractors for the coke ovens and by-product plant, benzole refinery, coal-handling plant, coke-handling and screening plant, and the boiler plant. Parolle Electrical Plant Co. Ltd., Newcastle, were responsible for the power generating plant, switchgear, etc.; W. C. Holmes & Co. Ltd., Huddersfield, for the gas purification plant; Gibbons Bros. Ltd., Dudley, for the gas dilution plant; J. M. Henderson & Co. Ltd., Aberdeen, for the coke stocking plant; and Mitchell Engineering Co. Ltd., Peterborough, for the mechanical handling plant.

# *Erection of first Heat-Exchanger at Berkeley*

On Thursday, April 3rd, the first of the sixteen large heat-exchanger (or steam raising) vessels for Berkeley nuclear power station was erected on site by John Thompson Ltd. The vessel, 70-ft. long, 17-ft. 6-in. diam., and weighing 133-tons, was transported over a distance of some 300 yards on two bogies from the Berkeley site boilershop, where its fabrication was completed, to its position adjoining No. 1 reactor house. The actual lifting into the erect position was effected by the use of a pair of gin poles, carrying tackle powered by two winches, with a 130-ft. boom/15-ton Lima crane operating as a retaining winch at the rear, or base, of the vessel. The time taken for the lifting operation, from the point when the vessel was aligned on its centre-line and lifting tackle made fast, was approximately three hours. This included the removal of transportation cradles and bogies, and the fitting of a tail bogie and rocker, on which the rear end of the vessel was borne during its movement forward in the lifting operation.



*The 133-ton heat-exchanger vessel after being lifted to its full height and about to be lowered on to its foundations adjoining No. 1 reactor house.*

In order to eliminate transport difficulties these heat-exchangers are fabricated in seven sections, viz. five cylindrical sections and a domed section for each end, at the John Thompson works at Wolverhampton. The sections are then transported singly to a boilershop specially erected at the Berkeley site. This site boilershop can accommodate four complete vessels at a time. The cylindrical body-sections of the vessel are each fabricated from two 1½-in. thick plates, roll-formed cold to shape, then welded together by a Union-melt welding machine. To provide rapid execution of this welding operation, the existing Union-melt machines at Wolverhampton have been supplemented by a new high-lift boom machine, capable of both inner and outer welds on the 17-ft. 6-in. diam. shells and having Ward-Leonard and high-speed rotating gear for control and high-speed setting-up. Other operations on the cylindrical sections at Wolverhampton include flame-cutting the holes, and welding-in the many sleeves required for pipework and tube connections to the heat-exchangers. The domed end sections of the vessels are similarly prepared at Wolverhampton so as to reduce sitework to a minimum.

Inside the Berkeley boilershop the sections are brought together in their correct order and the circumferential welds between them are made. This welding is carried out by hand, the vessel being rotated on turntables and the welding operation executed in the down-hand position, from staging erected along the full length of the shop, above the vessels. X-ray examination of all of the circumferential welds is also carried out in this shop. In addition to welding-up the sections to form a complete vessel, the skirt of the vessel is also welded on at this stage in the boilershop. This skirt, of welded plate fabrication, forms the base of the heat-exchanger and carries the fixings through which the vessel is bolted down to its foundations in its erected position. Upon completion of welds the vessels are stress-relieved in the area of the seams, by induction heating coils wrapped externally round the vessels in the area of the welded seams. The temperature is brought up to 600 deg. C. at a rate of 178 deg. C. per hour, with a soaking period of 1½ hours. The heat gradient is extended over a distance of 3-ft. on each side of the welded seam. After stress-relieving, all ports and sleeve connections for pipework are sealed, and the vessel hydraulically tested to a pressure of 240 lb./sq. in. The complete vessel, still on it, turntables, is then railed out on to the external loading bays where it is placed on road bogies for movement to its foundations adjacent to the reactor house.

Erection of the heat-exchanger vessel is immediately followed by construction of its associated structural steel-work, carrying galleries, ladders and supports for the externally mounted steam drums and pipework. The vessel is then cleaned internally by shot-blasting, and undergoes an air-pressure test. Tubing of the vessel is then commenced; the massed water tubes for the gas/water heat-exchange within the vessel having been prefabricated into tube packs at John Thompson works at Wolverhampton and sent to the Berkeley site in clean, polythene-wrapped condition, for building-up unit-by-unit inside the vessel, and welding to pipework connections. Plain tubes are used for the superheater sections, and finned tubes for the evaporator sections of the heat-exchanger.

At the time of lifting the first heat-exchanger vessel into position, work is proceeding rapidly on the construction of both No. 1 and No. 2 reactor houses and the turbine hall. Inside the reactor houses, the 1,000-ton reactor vessels are being fabricated by John Thompson welders, from 3-in. thick steel plate which had previously been pressed or roll-formed and edge-prepared at the Wolverhampton works.

# Extensions to Penal Power Station, Trinidad

*On February 26th, the Governor of Trinidad and Tobago, His Excellency Sir Edward Betham Beetham, K.C.M.G., C.V.O., O.B.E., officially opened a 20-MW extension to the Penal power station of the Trinidad and Tobago Electricity Commission. The original station, with a capacity of 5-MW, was completed in November, 1953, and very soon afterwards, a unit of similar capacity was installed. In addition to the present 20-MW extension, an order has been placed for a further similar unit of 20-MW capacity together with a 215,000 lb./hr. boiler, which it is anticipated will be constructed and placed in operation within the next two years*

TWENTY-FIVE years ago Penal was only a small village, the land being occupied by peasant farmers whose main crops were rice, sugar-cane, water melons and market-garden produce. There was ample water for the rice crop—so much, in fact, that the Oropouche Lagoon, which bordered both sides of the road from San Fernando to Penal was in flood every year from the Godineau and Curamata rivers, and at the height of the rainy season Penal itself was affected. Irrigation of the district was started in the 1930s, and as the scheme progressed, the flooding decreased. Even so, the area is still subjected to periodic flooding.

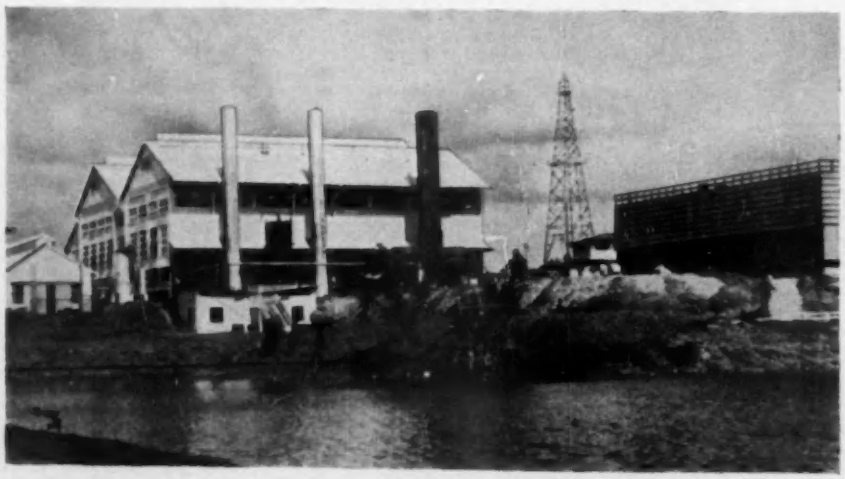
At the time there was no industry at Penal, prices for produce were low, and the local farmers were experiencing great difficulties. The town was, however, soon to become important in the life of the Colony, for in the year 1938 United British Oilfields of Trinidad Ltd. (now Shell Trinidad Ltd.), discovered the presence of oil in commercial quantities.

In the early 1940s considerable thought was given to the need for a power station in the area, and various sites were proposed and inspected. From 1946 onwards these activities increased, until the present site was chosen and the Penal project became a reality, the station being opened on November 21st, 1953.

The power station occupies a 48-acre site in the south of the island of Trinidad, adjacent to the oil-fields of Shell Trinidad Ltd., from which source natural gas is supplied for firing the three boilers which comprise the steam generating plant. Units Nos. 1 and 2, supplied by Babcock & Wilcox Ltd. are header-type boilers, each designed for a normal rating of 60,000 lb./hr. of steam at a pressure of 425 lb./sq. in. and a temperature of 740 deg. F., while the new No. 3 unit, also of the Babcock & Wilcox header-type, is of much larger capacity, having a peak load rating of 240,000 lb./hr and a M.C.R. of 215,000 lb./hr. at 620 lb./sq. in. and 865 deg. F. Babcock & Wilcox were also responsible for the high-pressure steam and the water pipework, and for the construction of the new steel chimney, which is of the self-supporting type.

The new boiler has a completely water-cooled furnace, formed by bare tubes connected into the natural circulation system, while the superheater and economiser sections comprise seamless tubes assembled into multi-loop banks by the fusion welding process; alloy steel being utilised for the high-temperature steam section. The unit has a total heating surface of 19,003 sq. ft., made up of boiler tubes, etc., 5,520 sq. ft., superheater (total) 11,940 sq. ft., and furnace section 1,543 sq. ft. The fusion-welded boiler drum, which has a wall thickness of 2⅜-in. is set with its centre-line approximately 50-ft. above the floor level. The drum is 37-ft. long by 4-ft. 6-in. diam., and is equipped with standard Babcock & Wilcox cyclones and steam scrubbers. The complete boiler unit is supported by a steel framework, and enclosed in heat-insulating material, supplied by Newalls Insulation Co. Ltd., the whole being covered by a sheet-steel casing. Nineteen Babcock & Wilcox soot-blowers are provided for cleaning the boiler and superheater sections.

Feedwater regulation is effected by means of a Copes "Flowmatic" con-



*A general view of the Penal power station. On the right can be seen the mechanical draught, film-flow type cooling-towers supplied by Film Cooling Towers (1925) Ltd., and in the foreground the 6 million gallon capacity artificially-formed lake*

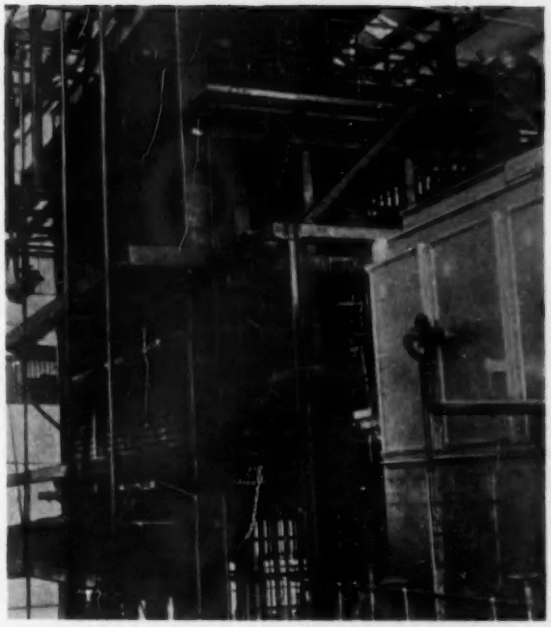
troller, supplied by Copes Regulators Ltd. Chemical dosing equipment was supplied by United Water Softeners Ltd., London (a subsidiary of the Permutit Co. Ltd.), and consists of three sets of "E"-type proportional feeders and two Mark V high-pressure phosphate pumps.

The plant is equipped with two "Sirocco" F.D. and two I.D. fans supplied by Davidson & Co. Ltd. The 35-in. single-inlet H.E. 90 F.D. fans drawing air supply direct from atmosphere are driven by Lancashire Dynamo & Crypto 110 b.h.p., 880 r.p.m. screen-protected motors through Wellman Bibby couplings. The 47½-in. single inlet I.D. fans with suction boxes are also driven through Wellman Bibby couplings, but by 150 b.h.p. Lancashire Dynamo motors at a speed of 705 r.p.m. Davidson & Co. have also received an order to supply similar fans for the Babcock & Wilcox boiler being supplied for the further 20-MW extension to the station. The F.D. fans deliver air for combustion to the burners via a Babcock & Wilcox air-heater consisting of two large banks of vertical steel tubes placed in the outlet flue at the rear of the boiler, and having a heating surface of 25,100 sq. ft.

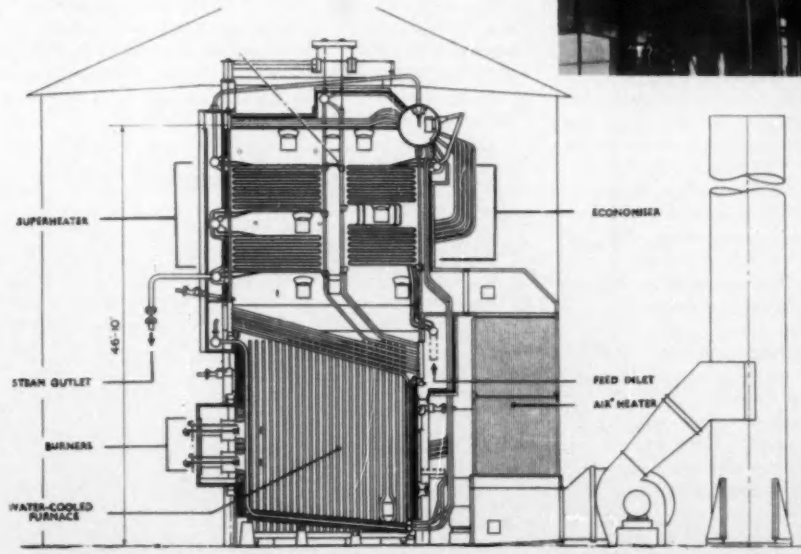
Eight B. & W. combined gas or oil-burners are provided, and these are capable of producing the full output from the boiler when firing with natural-gas through the multispud gas burners, or in the event of a failure of the gas-supply, heavy-grade fuel-oil in the wide-range "Y"-jet oil-atomisers. The oil-burners are used for lighting-up purposes, the oil being delivered at the correct viscosity by two pumping and heating units, incorporating one steam-driven, and one electrically-driven oil-pump. The motor driving this pump is a 9 b.h.p. unit, running at 1,140 r.p.m., and supplied by Lancashire Dynamo & Crypto Ltd.

A complete set of boiler valves and mountings were supplied by Dewrance & Co. Ltd., and these include an electrically-operated steam outlet valve, stop valves, safety valves, and high and low-water whistle alarms.

The boiler/turbine instrumentation and automatic combustion control equipment were supplied by Electroflo Meters Co. Ltd., the controls and instruments being grouped on a cabinet-type panel. The control system ensures a continuous steaming rate with either gas or oil-firing, while an electrically-operated valve installed in the gas supply main, and interconnected with the fan switchgear, is available to shut down the boiler automatically in the event of a failure in either the gas-supply or the draught plant. Lockheed hydraulic damper control equipment, supplied by Automotive Products Co. Ltd., comprises power-hydraulic centralised controls, with manual-hydraulic standby, for the superheater by-pass dampers. This equipment is unusual in that seven large (1¾-in. bore by 14-in. stroke) non-locking high-duty cylinders are employed, and that each of these cylinders is arranged to operate two dampers, hydraulic locking being provided by the use of "Hydroloc" valves at the full area ends of the cylinders. In addition, the motor-



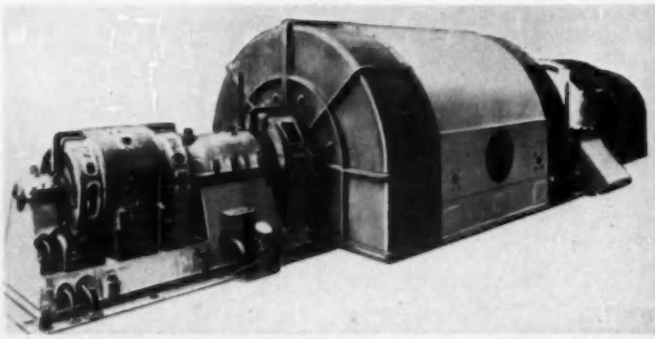
*(Above). The new Babcock & Wilcox boiler under construction at Penal power station. On the right can be seen part of the existing No. 2 boiler.*

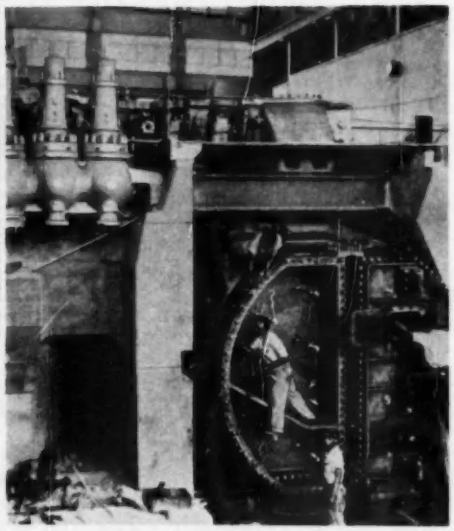



*(Left). Sectional arrangement of the new 215,000 lb./hr. Babcock & Wilcox header-type boiler. An exactly similar unit is being supplied for commissioning within the next two years.*

pump unit, instead of being mounted in the control cabinet in accordance with usual practice, is installed separately in a small housing of its own. In connection with this equipment seven separate edgewise regulating indicators are employed to indicate to the operator the stroke position of each of the seven cylinders continuously. Gas and oil flowmeters were supplied by George Kent Ltd.

fans, these units also being used to ventilate, through an air-filter, the main pilot-exciters that are direct-coupled to the generator. The cooling fans are driven by 145 b.h.p., 1,170 r.p.m. screen-protected motors made by Lancashire Dynamo & Crypto Ltd. The 11.4-kV busbars connect the generators, by 25,000 kVA transformer capacity, to the 66-kV busbars, the transformers being arranged for low-voltage remote electrical control from a panel in the





*(Above). The new 20-MW turbo-alternator set supplied by C. A. Parsons Co. Ltd., which operates with steam conditions of 600 lb./sq. in. and 850 deg. F.*

*(Right). View in the turbine house basement showing erection work in progress on the condenser plant and turbine steam valves.*

The new 20-MW turbo-alternator set was supplied by C. A. Parsons & Co. Ltd., and is designed to operate at 3,600 r.p.m. with steam conditions of 600 lb./sq. in. and 850 deg. F., exhausting at a vacuum of 27.25-in. to a three-pass condenser which is supplied with 13,000 gal./min. of circulating-water at a temperature of 92 deg. F. Duplicate extraction pumps and air-ejectors are provided.

Cooling-water is taken from four wells which were sunk at one extremity of the station site, while an ample reserve supply of 6 million gals. is available from an artificially-formed lake. The cooling-towers associated with the new unit were supplied by Film Cooling Towers (1925) Ltd., and are of the mechanical-draught, film-flow type, constructed of chemically-impregnated timber. The required circulating-water pumps were supplied by Harland Engineering Co. Ltd., the necessary valves by Glenfield & Kennedy Ltd., while Stanton Iron Works Ltd. were responsible for supplying the circulating-water pipework.

The boiler feed pumps were made and supplied by G. & J. Weir Ltd. There are three Weir eight-stage electrofeeders, each with an output of 132,000 lb./hr. at a discharge pressure of 850 lb./sq. in. when running at 3,500 r.p.m. Each pump is fitted with a Weir non-return discharge valve. In standby there is one Weir turbine-driven three-stage boiler feed pump, fitted with automatic cut-in gear. This pump has an output of 126,000 lb./hr. at a discharge pressure of 850 lb./sq. in. when supplied with steam at 620 lb./sq. in. and 865 deg. F. The electrofeeders are each driven by a 255 b.h.p., 3,550 r.p.m. drip-proof motor made by Lancashire Dynamo & Crypto Ltd.

The alternator associated with the Parsons turbine is a 25,000-kVA, 0.8 p.f., 2-pole machine, generating 3-phase, 60 c/s current at 11,450-V. It is cooled by air circulated through a closed-circuit by two motor-driven

station control room. New switchgear supplied by A. Reyrolle & Co. Ltd., includes additional circuit-breakers for two transformers, one 15-MVA and one 10-MVA for stepping-up the voltage to 66,000-V before transmission to a sub-station, and a further 1-MVA transformer supplying station auxiliaries at 415-V.

## GAS COUNCIL MIDLANDS RESEARCH STATION

The Midlands Research Station of the Gas Council at Solihull, Warwickshire, was officially opened by Sir Cyril Hinshelwood, President of the Royal Society, on April 1st, 1958, when the opportunity was taken to make known some of the more important aspects of the research programme being carried out. For the most part the work is directed towards the investigation of gas-making processes utilizing low-grade coal, hitherto thought unsuitable—i.e. "gasification" processes operating at pressures of several atmospheres, as distinct from "carbonisation" processes. If such processes should prove successful it is thought that in the future gas would be manufactured in a limited number of "super" stations situated near coal mines, and the conclusion has been reached that the most suitable type of pressure gasification process for this purpose will use powdered coal, so that, with the so-called "fluidised" technique, the maximum control is obtained over the chemical reactions. The powdered coal will be treated under pressure, first with hydrogen to produce by-products and the rich constituent of the final gas. The solid residue from this hydrogenation will then be gasified to completion in oxygen and steam. It is thought that such a two-stage process can be developed to meet all the requirements and, at the Research Station, a pilot scale plant is being erected. For a number of reasons, however, work is not confined to this one process. In addition to experiments on the fluidised process, work is also proceeding on the best of other available pressure processes so as to make them suitable for immediate installation. Pressure processes for gasifying oil are also being developed.

# Steam Economy in Calcium Nitrate Production

By J. GRINDROD, B.A.(Com.)

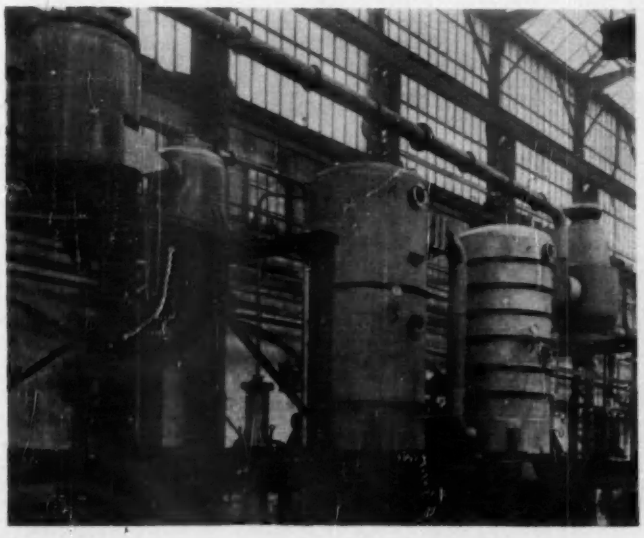
MORE than two million tons of the fertiliser calcium nitrate was consumed throughout the world in 1955, and until recently when a continuous process was developed in Holland, annual tonnages of this order were produced by the batchwise evaporation process. The new process is claimed to have certain advantages, including a satisfactory heat economy, achieved by the use of a small heating surface resulting from the special design of the evaporators. Calcium nitrate is unusually associated with the production of ammonia and nitric acid, the latter being derived from ammonia by oxidation. It is composed of $Ca(NO_3)_2$ and $NH_4NO_3$ in a ratio of 5 to 1. The $NH_4NO_3$ is added to improve crystallisation on the cooling drums. In the processing of calcium nitrate, limestone is dissolved in $HNO_3$, excess $HNO_3$ being added to adjust the correct proportion of $Ca(NO_3)_2$ and $NH_4NO_3$. The resulting product is neutralised with $NH_3$ and is then subjected to filtration, evaporation, crystallisation, crushing and screening processes.

The batchwise evaporation process was used in the past because both the boiling point and the viscosity of calcium nitrate solutions rise very considerably during evaporation. In Holland, however, Werkspoor N.V. of Amsterdam have carried out a special investigation into the evaporator section of the process and have successfully developed the continuous process whereby the calcium nitrate solution can be evaporated to the final concentration in two evaporation stages—a low-pressure and a high-pressure stage. For the double effect system, it was decided to adopt the counterflow principle, so that in the second or high-pressure evaporator the viscosity of the solution would remain fairly low, while crystallisation would not take place at this stage. In the high-pressure evaporator a concentration of approximately 95 per cent. nitrate of lime is achieved with a steam pressure of between 14 and 15 atm. (206 to 220 lb./sq. in.). The solution leaving this evaporator, which is at a relatively high temperature, is cooled in a flash evaporator and, at the same time, concentrated to a smelt of 100 per cent. calcium nitrate (15.55 per cent. total nitrogen and approximately 16.6 per cent. water).

By the adoption of this process, it is claimed that a saving in steam of 0.5 kg. (1.102 lb.) of steam per kg. (2.204 lb.) of evaporated water was achieved, together with a more uniform steam consumption, an important factor in boiler house operation. Smaller buffer tanks were utilised and the regulation of the process required less attention and called for fewer operations, thus reducing the number of personnel engaged in the process. Automatic control of the process is, in fact, considered quite feasible. It is thought that a product of constant composition could be produced, and in addition there would be less danger of breakdown through solidification of the product in cooled lines, etc.

The practical application of the process was effected in close co-operation with MEKOG at Ijmuiden and for this purpose it was possible to use most of the equipment already in use. Though, initially, some difficulties were experienced with the flash evaporator, these were satisfactorily overcome and the installation came fully up to expectations, the saving in steam, for example, being quite considerable. A new plant was subsequently built in which a further improvement in the performance of the evaporator was obtained by introducing the principle of controlled evaporation. This resulted in a high mean capacity per sq. ft. of heating surface. Previously, extensive experiments with controlled evaporation had been carried out by the Research Department for Chemical Engineering of Werkspoor in a pilot plant. These had shown that controlled evaporation would result in a considerable reduction of the heating surface and, consequently, in a decrease in the initial capital outlay for the process.

With controlled evaporation, the space in the evaporator containing the liquid is subdivided into compartments by means of partitions, the solution to be evaporated passing through these compartments in a given sequence, causing its concentration and thus also its boiling



*Continuous evaporation plant for production of calcium nitrate at the works of Werkspoor N.V., Amsterdam.*

point and viscosity to increase proportionately. This occurs to the greatest extent in the high-pressure, or second of the evaporators, where the advantage is, of course, the most pronounced. In the four sections of the body of this evaporator the concentration of calcium nitrate increases from rather less than 80 per cent. at the beginning of the first section to about 95 per cent. at the end of the fourth section. This increase in concentration finds immediate expression in the heat transfer co-efficient which falls rapidly. The available temperature difference between the steam temperature and the boiling temperature, an important factor when considering evaporative capacity, is also dependent on the concentration and falls from approximately 63 deg. C. at a concentration of —80 per cent. to 40 deg. C. at a concentration of 95 per cent.

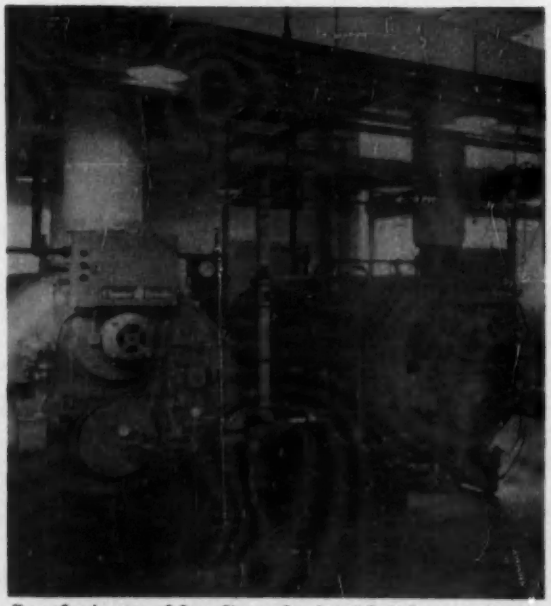
With the high-pressure evaporator divided into compartments and operating on the controlled evaporation principle, only the contents of the last section contains the final concentration of 95 per cent. calcium nitrate, which is the concentration of the product leaving the evaporator in continuous flow. Because sections one to three operate under much more favourable conditions as regards the available temperature difference and heat transfer coefficient value, their mean water evaporating capacity is considerably higher than that of section four. Using an evaporator without controlled evaporation the whole of the evaporator content is subject to the final concentration. This means that the available temperature difference and the heat transfer coefficient, and consequently the water evaporating capacity, are at the lowest possible figure.

The company point out that, with the application of controlled evaporation, the mean water evaporating capacity of the second evaporator is approximately twice as high as that of section four and that the evaporator can be made half the size of an evaporator without subdivision. The advantage of controlled evaporation is not, of course, so obvious in the low-pressure, or first evaporator, where the saving in heating surface is approximately 20 per cent.

For further processing, the hot mass coming from the evaporating installation is passed into a stirring tank, whence it is conducted to the cooling drum, where the smelt cools off in a thin layer, the solidified product being scraped off with knives. The flakes are then crushed to grains, which are subsequently screened. The output from one continuous evaporation unit is said to be in the region of 15 tons of product per hour.

## AMERICAN BOILER TO BE BUILT UNDER LICENCE IN THIS COUNTRY

An agreement has been concluded between Marshall Sons & Co. Ltd., Britannia Works, Gainsborough, Lincs., and the Cleaver-Brooks Co. of Milwaukee, Wisconsin, U.S.A., whereby the English company will manufacture under licence a range of Cleaver-Brooks oil-fired, fire-tube, "packaged" steam and hot water generators with capacities from 500 to 20,000 lb./hr., at pressures up to 250 lb./sq. in. These units, which are of all-welded construction will be of the four-pass type—a design feature which, by reducing the number of tubes in each successive pass, is claimed to maintain the continuously high flue-gas velocity essential to high heat transfer. Both boiler ends are hinged, allowing easy access to the tubes for cleaning and servicing. The boiler front incorporates a low-pressure air-atomising oil-burner, which is also easily accessible for cleaning. Air for atomisation is provided by a caseless fan mounted inside the front head, ensuring operation at a low noise level.



*Two of a battery of four Cleaver-Brooks oil-fired fire-tube "packaged" boilers, each with a capacity of 2,760 lb./hr. Units of this type are now being manufactured under licence by Marshall, Sons & Co. Ltd., Gainsborough, Lincs.*

The decision to manufacture a complete range of "packaged" steam generators has necessitated the establishment by Marshall Sons & Co. Ltd., of a completely new organisation, including central sales, engineering, service and spares departments at Gainsborough, and the installation of further plant in their manufacturing departments. It is the company's intention to be in a position to provide spares and service facilities at 24-hr. notice, and to this end area agents will be appointed throughout the United Kingdom. It is perhaps of interest to note here that since 1931 Cleaver-Brooks have supplied approximately 30,000 "packaged" boilers in a range of sizes, for use in a variety of industrial and commercial undertakings. They do in fact, claim that last year they manufactured 35 per cent. of all the "packaged" fire-tube units in the United Kingdom.

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**Atomic Power Constructions Ltd.** and **Babcock & Wilcox Ltd.** announce that an agreement has been completed whereby Babcock & Wilcox will undertake detailed design, manufacture and erection of the reactor pressure vessels for nuclear power stations to be supplied by Atomic Power Constructions Ltd. and their member companies, **Crompton Parkinson Ltd., International Combustion (Holdings) Ltd., Richardsons Westgarth & Co. Ltd., Elliott Brothers (London) Ltd., The Fairey Aviation Co. Ltd.** and **Nuclear Civil Constructors.** In addition, Babcock & Wilcox will supply any special heavy-duty crane required by Atomic Power Constructions Ltd. for the erection of pressure vessels, heat-exchangers and other components. The crane department of Babcock & Wilcox are at the present time constructing a 400-ton Goliath crane for the Hinkley Point nuclear power station contract, to facilitate erection of the reactors and associated equipment.

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### Oil Price Correction

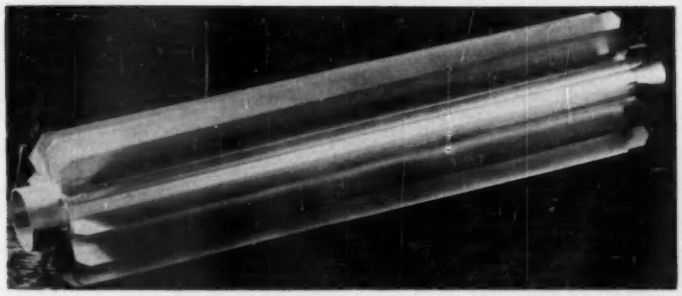
On page 79 of the March, 1958, issue of this journal we published some notes concerning the Powermaster packaged automatic oil-fired boiler installation at The Bourne Hygienic Laundry, Bourne, Lincs. It is regretted that owing to a typographical error we were given the price of 950 sec. oil as being 10½d. per gallon. We are now informed that this should have been 1s. 0½d. per gallon.

# Mechanical Handling Exhibition

*Notes on some of the exhibits at the sixth Mechanical Handling Exhibition which was held at Earls Court, London, from May 7-17th*

**Accles & Pollock Ltd.,** *Oldbury, Birmingham*

Examples of cold-drawn seamless precision tubing in steel, stainless steel, and other metals will be exhibited on the Accles & Pollock stand, together with machined and honed bore tubes ; jack bore tubes ; manipulated and fabricated tubing ; steamless flexible tubing ; tubular special sections ; extended surface tubing ; and finned tubing in aluminium Magnox 12 and stainless steel.



*An example of finned tubing manufactured by Accles & Pollock Ltd., as used for fuel element cans.*

**W & T Avery Limited,** *Soho Foundry, Birmingham, 40*

Weighing for automatic production processes will be demonstrated on the W & T Avery Ltd. stand by a hopper scale operating in a simple blending process. By means of electric signals, control information is fed to the scale from punched cards, and performance data are taken from the scale for production record purposes through a punched card machine and a printing, listing, totalising and punched tape machine. Also of interest will be a pneumatically-operated scale which automatically weighs and fills a succession of containers with a predetermined net weight of material ; an Avery constant-rate feeder scale ; and an automatic high-speed packet check-weigher. An application of the Avery electronic switch to repetition weighing processes will be included as a separate exhibit.

**B.T.R. Industries Ltd.,** *Herga House, Vincent Square, London, S.W.1*

A new fire-resistant conveyor belt, specially designed for carrying loads on steep gradients, has been developed by BTR Industries Ltd. and will be shown for the first time on the company's stand. Also shown for the first time will be High Test V-belts in "grommet" construction and a range of High Cap V-belts. Working displays will include a demonstration of carrying packages on steep inclines by means of "Gripface" conveyor belting, and there will also be displayed a comprehensive selection of the company's rubber and thermoplastic products including "Pluvicor" fire-resistant (P.V.C.) conveyor belting ; rubber and canvas conveyor belting ; transmission belting ; impact idlers and anti-vibration mountings ; and a selection from the numerous industrial hoses made by the BTR Group including the "Hi-Flex" range of high-pressure hoses.

**E. Boydell & Co. Ltd.,** *Elsinore Road, Old Trafford, Manchester, 16*

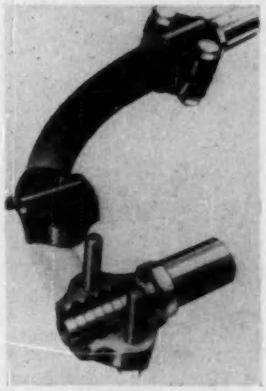
Exhibited for the first time by this company will be the Muir-Hill model 4-WL tractor shovel, a heavy-duty machine designed to provide crawler tractor performance with the manoeuvrability of a rubber tyred unit. This is achieved by four-wheel drive transmitted through large wheels at minimum centres. A six-speed gear-box is provided and this, together with supplementary hub-reduction gear, gives a choice of twelve forward speeds and four reverse. Equipped as standard with a $\frac{3}{4}$ cu. yd. full-width bucket and full-flow filtered hydraulic system with double-acting rams to both beam and bucket, automatic or driver controlled "roll-back" action is afforded. Other machines from the well-known Muir-Hill range will include the Cardinal loader ; the LH-1 industrial power loader ; and the Muir-Hill shunter.

**David Brown Construction Equipment Ltd.,** *Hanworth Park, Feltham, Middlesex*

The principal exhibits on the David Brown stand will be two new industrial tractors (one wheeled and one tracked). The tracked machine is the David Brown overshot loader which has a 1 cu. yd. hydraulically-operated bucket integrally mounted on a 50TD tracklayer chassis powered by a 6 cylinder 50 h.p. Diesel engine with 6-speed gearbox. Of the eight-wheeled industrial tractors in current production the David Brown 900 industrial model is shown with new front end loader, capable of lifting more than half-a-ton to a height of over 9-ft. in approximately six seconds. Alternative and additional attachments available for use with the loader are ; $\frac{1}{2}$ cu. yd. bucket ; fork-lift ; lifting-platform ; dozer-blade ; radiator-guard ; and all-weather glass fibre cab. The tractor to which the loader is fitted is an industrial version of the well-proven David Brown 900 agricultural tractor powered by a 40 b.h.p. Diesel (or petrol) engine, with 6-speed gearbox. Among a varied selection of gearing products designed for mechanical handling applications will be the latest addition to the well-known range of "Radicon" worm gear units, the new size-2$\frac{1}{2}$ "Radicon" double reduction unit, and another principal exhibit in this category is the new "Varicon" stepless speed reducer. Finally, the David Brown display will include "Coventry" geared motors and co-axial gear units suitable for drives of 0.17 h.p. to 15 h.p. ; a full range of David Brown floating reamers, now available in 23 sizes from $\frac{1}{2}$-in. to 8-in. ; a display of stock sizes of "Radicon" worm reducers, i.e. from 3-in. to 14-in. centres ; "Roliod" gear pumps ; "Keighley" stock spur gears ; transmission gears for many types of mechanical handling equipment such as fork lift trucks ; hobs and cutters, and jigs and fixtures.

**British Ermeto Corporation Ltd.,** *Beacon Works, Hargrave Road, Maidenhead, Berks*

The British Ermeto Corporation Ltd. will be showing a comprehensive collec-

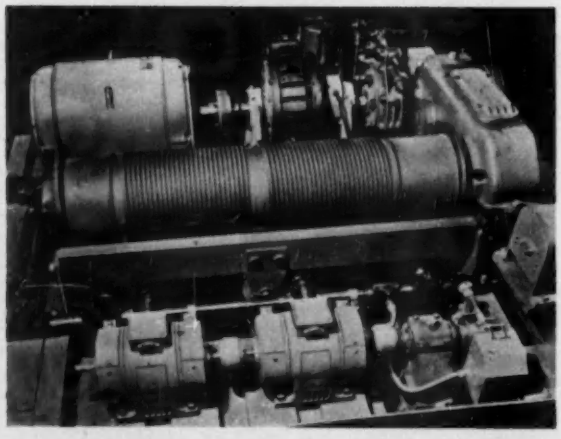


*The Ermeto twin-saddle renewable hose-end.*

tion of high-pressure couplings to suit nominal bore pipe in sizes from ¼-in. to 1½-in. and outside diameter pipe in sizes from ¼-in. to 2-in. for use at working pressures up to 10,000 lb./sq. in. depending upon their size, material and working conditions. Various types of high-pressure valves for use in hydraulic systems will be shown, and the display will include Ermeto twin-saddle renewable hose-ends which are being shown for the first time. An associate company, Simplifix Couplings Ltd., will be showing a wide range of brass compression couplings, including a recently developed range for use on plastic-covered copper tube.

**The British Thomson-Houston Co. Ltd.,** *Rugby*

British Thomson-Houston exhibits will be representative of their extensive range of electrical equipment made for mechanical handling applications, and will include British Standard dimension motors ; electro-hydraulic thrustors available in sizes ranging from 40-lb. thrust through a 2-in. stroke to 800-lb. through a 12-in. stroke ; models demonstrating the efficiency of fractional horsepower motor components ; geared motor units ; a new capacitor/D.C. dynamic braking system ; and crane protective panels. Electronics will be represented by the company's " Emotrol " (electronic motor control) ; applications of photo-electric and timer equipment to conveyors ; infra-red devices ; and " Portavox " mining telephone reinforcement equipment. Also on show will be a full-size BTH console, controlling a working model of a 110-Ruston-Bucyrus excavator.



*(Left). British Thomson-Houston " Varislip " units shown in the foreground of a 5-ton " Vestax " series-II crab.*

*(Right). The new Vulcan - Sinclair steel traction coupling which is especially suitable for underground mining applications.*

**Broom & Wade Ltd.,** *P.O. Box No. 7, High Wycombe*

The main exhibits on the Broom & Wade stand will include a range of pneumatic hoists with capacities from ½-ton-1-ton, fitted with link-chain, roller-chain and wire-rope, and featuring the recently introduced " Aro-Broomwade " hoist, weighing 29-lb., measuring 10½-in. × 5-in. dia., and capable of lifting ½-ton at approximately 25-ft./min. Other units to be displayed are air-operated winches, including a warping drum winch specially designed as a sediment hoist ; and spring balancers of 5-lb. and 10-lb. capacities. Also on show will be examples of stationary air/compressors.

**The English Electric Co. Ltd.,** *Marconi House, Strand, London, W.C.2*

The English Electric exhibit will comprise a number of industrial motors including a complete range of ventilated type, standard dimensioned 65 deg. C. rise motors to the new B.S. Specifications; Buxton-certified flameproof motors for hazardous duties below ground or on the surface in explosive atmospheres ; and short-time rated slipring crane motors which feature low rotor current. The display will also include a special totally-enclosed fan-cooled motor with a built-in braking system ; D.C. protected-type motors of a new design to the latest specifications ; and British Standard dimensioned totally-enclosed fan-cooled motors, both foot and flange mounted types. Geared motor units will be shown in operation.

**Felco Hoists Ltd.,** *29, Cromwell Road, South Kensington*

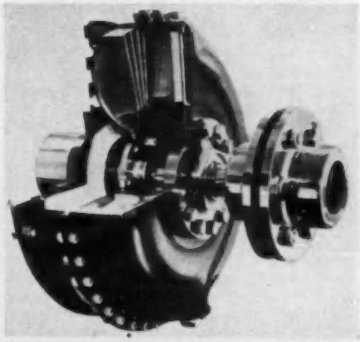
Individual units from the range of Felco hand- and power-operated lifting appliances will be exhibited, including hand-operated triple-gear chain pulley blocks of super roller bearing and standard types, overhead travelling trolleys and travelling chain blocks incorporating the desirable features of short headroom, light weight, robustness and maximum safety. Ratchet hoists with a patented overload preventer device giving maximum safety, security and reduced maintenance costs will be shown, and other equipment will include " Adjust-A-Leg " equalising slings for lifting unbalanced loads ; electric chain blocks and electric wire rope blocks of the short headroom type ; Templewood spring-balanced crane forks ; self-supporting pillar jib cranes ; and a completely new range of " Low-Lift " hydraulic jacks of 10 to 30-tons capacity.

**Fisher & Ludlow Ltd.,** *Material Handling Division, Bordesley Works, Birmingham, 12*

A number of new developments will be shown by Fisher & Ludlow, and among those of particular interest are " Flexiroll " troughing idlers which incorporate nylon bearings, and, the company claim, require no maintenance. The fact that there is no metal to metal contact eliminates the risk of fire, and the idlers are also resistant to corrosion and abrasion. " Flowlink " overhead chain conveyor used in conjunction with the " Towline " mobile trucks will be shown as a working demonstration, and other exhibits include the " Flowline " roller top conveyor and the " Flowporter " belt conveyor system. Examples of the company's comprehensive range of pallet equipment will also be displayed.

**Fluidrive Engineering Co. Ltd.,** *Worton Road, Isleworth, Middlesex*

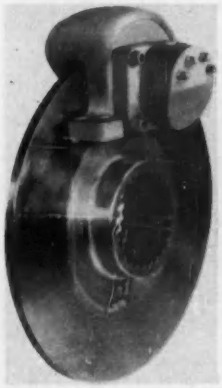
Two new Vulcan-Sinclair fluid couplings will be exhibited by Fluidrive Engineering, both of the traction type with a stepped circuit. The steel traction coupling, S.T.C., has a pressed-steel casing and is especially suitable for underground mining applications, where it is necessary for the motor to accelerate quickly to full speed under heavy load, despite the starting voltage drop. For diesel engine drives the low idling drag torque and short length are valuable features. The second new item, the Fluidrive pulley, comprises a fluid coupling and a vee-rope pulley for direct mounting on the motor shaft. It is particularly advantageous for vee-rope drives where an outboard bearing is undesirable. In addition, Vulcan-Sinclair fluid couplings of both traction and scoop-type will be exhibited in sectional form, as well as working models, in order to demonstrate the respective characteristics. A range of standard runners, from size 6 to 46, corresponding to a power transmitting capacity at 1,000 r.p.m. of 1/10th h.p. to 2,500 h.p. will be on view, as will photographic examples of a wide range of Fluidrive mechanical handling applications.



**Goodyear Tyre & Rubber Co. (Great Britain) Ltd.,** *Bushbury, Wolverhampton, Staffs*

Goodyear will be showing for the first time " Armadillo " chute-lining, a tough rubber sheet compounded to withstand maximum abrasion, and used for the protection of chutes, conveyors, scrapers, etc. Also on view will be the company's full range of conveyor belting, including the " Stacker " belt designed for carrying

materials of a highly abrasive nature; "Style B" belting for coal, sand, gravel and general service; and "Style HRS" for high-temperature applications. A representative selection of Goodyear industrial hoses will be shown, including the long-length hose, perhaps the most important recent addition to the range, and available in lengths up to 500-ft. for sizes up to and including 1-in. diam., and up to 250-ft. for sizes over 1-in. A number of different constructions are available for applications including water, air, oxy-acetylene, and solvents. A special display of suction and discharge hoses for the oil industry will be included in the display, together with a full range of hose fittings. Also exhibited will be belts for industrial drives, and examples of the company's disc brakes.



*A floating disc and fixed housing type of industrial brake as manufactured by Goodyear Tyre & Rubber Co. (Great Britain) Ltd.*

**Greenwood & Batley Ltd.,** *Albion Works, Leeds, 12*

Greenwood & Batley Ltd., manufacture fixed and elevating platform trucks from 10 cwt. to 10 tons capacity, fork trucks from 2 to 15 tons capacity, and battery and trolley locomotives from 2 to 20 tons. On show will be a typical selection including a 6-ton battery electric-locomotive with flameproof electrical equipment approved for use underground in gaseous coal mines; and a battery electric fork-lift-truck arranged with a ram in place of the forks for lifting coils of metal strip. These trucks will carry a load of 11,000 lb. at 24-in. from the heel of the forks. The lift is hydraulically-operated with a height of 9-ft. 6-in. at a speed of 12-ft. per minute. There is a hydraulically-operated 3 deg. forward and 10 deg. backward tilt. Also exhibited will be a 5-ton battery electric elevating-platform-truck with platform 78-in. long × 30-in. wide; and a 2-ton capacity battery electric fixed-platform-truck with platform 77-in. long × 45-in. wide.

**International Combustion Products Ltd.,** *19, Woburn Place, London, W.C.1*

International Combustion will be exhibiting for the first time a complete working twin-belt conveyor mounted in a gantry section, and incorporating a Pollock coal sampler and sampling equipment typifying the complete conveying and sampling plants installed by the company. Other handling plant including Beaumont skip-hoists and drag-scrapers, gravity bucket conveyors and ash-handling systems will be represented by working models. The "Dynocone" continuous bowl centrifuge, also to be shown for the first time, is used extensively for de-watering and classifying in the coal and chemical fields and for gas works by-product plant. The "Full-Floating" Ty-Rock screen to be displayed is widely used for coal screening and is claimed to give complete freedom from vibration in the supporting structure and take any form of "out of balance" or "shock" loading. Vacseal pumps, specifically designed to handle abrasive solids in suspension, and the Vacseal sump pump are also included in the exhibit.

**C. H. Johnson (Machinery) Ltd.,** *Adswood Road, Stockport, Cheshire*

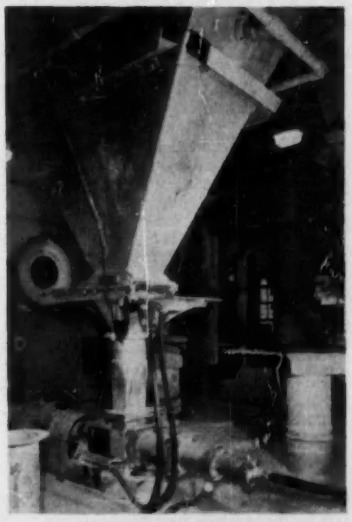
There will be four new items among the exhibits on the C. H. Johnson (Machinery) Ltd., stand. The first is the Johnson-Vilver industrial lifting-platform. A range of four basic types are available with loading capacities of 1½-tons to 15-tons, the lifting platform varying in size from 5-ft. × 3-ft. 3-in. to 26-ft. × 7-ft. 7-in. The second is their "Cadet" lifting platform, the smallest basic unit within the range, having a maximum capacity of 30 cwt. and a platform 5-ft. × 3-ft. 3-in. The third item is "Corruband" flanged conveyor belting, which incorporates corrugated flanges 3-in. deep and is so designed that belts up to 4-ply can be employed on drums as small as 7½-in. diam. The fourth new exhibit is the Johnson-Bauer conveyor drum motor, which is available in a wide range of sizes and horse-power from 6-in. diam. × ¼ BHP to 20-in. dia. × 15 BHP.

**Mavor & Coulson Ltd.,** *Bridgeton, Glasgow, S.E.*

Three sizes of driving gear for belt conveyors will be exhibited on the Mavor & Coulson stand, including the new "Size 25" which can take 6 h.p. from the motor when the belt speed is 270 ft./min., and will be shown at work, driving a belt conveyor which runs on a new form of sectional belt conveyor the stringer structure type-2. Each of the three sizes can be driven by any type of motor or engine. The silent V-ropes absorb the shock of any sudden heavy load, and the second speed reduction runs in oil. The drives are self-contained and weather-proof. Idlers will be shown for supporting and guiding the belt under all kinds of conditions and for many widths of belt; the cushion idler for receiving points and the steering idler for reversible conveyors being displayed in sections.

**Mono Pumps Ltd.,** *Mono House, 1, Sekforde Street, London, E.C.1*

A representative range of Mono pumps will be displayed, and their use as a unit for transferring wet pulps, viscous fluids and dry powders will be demonstrated. One unit will show the powerful suction capabilities of the pump when handling a heavy concen-



*(Above). A P12 Mono powder pump handling dry silica finings, at the rate of 5,000 lb./hr., for refractory brick production.*

*(Below). Belt conveyors for a large power station coal-handling plant installed by International Combustion Products Ltd.*

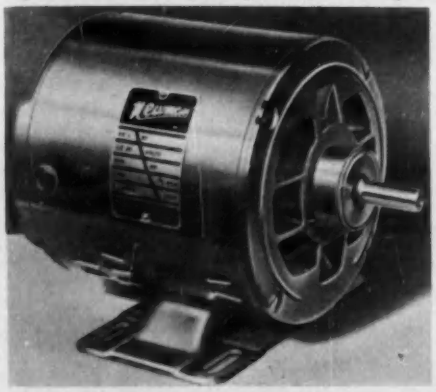
tration of pulp, while another will be handling solids in suspension. A demonstration of powder pumping through a pipe circuit will also be included. The powder handling method evolved by the P12 Mono powder-pump uses the technique of fluidising powder by air injection, but it is utilised only to ensure the powder behaves in a similar manner to fluid. Consequently, as the air is not used to blow the powder through the pipeline, it is kept within very low limits. Within the confines of the stand the P12 Mono powder-pump needs only 1¼ cu. ft./min. of free air at 5 lb./sq. in. to pump 100 cu. ft. of powder per hour around 50-ft. of piping arranged at a height of 10-ft. A photographic display will depict a number of existing installations incorporating Mono pumps.

**The New Conveyor Co. Ltd.,** *Brook Street, Smethwick, Birmingham*

A series of photographs will be displayed on this stand to show the various applications of Newcon plant. Actual exhibits will include a tubular vibrating conveyor; a tray-type vibrating conveyor; a 9-ft. length of sectional belt conveyor; six types of belt conveyor idlers; six types of gravity roller conveyor; and four conveyor drums. A bottle slat chain conveyor will also be exhibited together with four types of overhead chain conveyor.

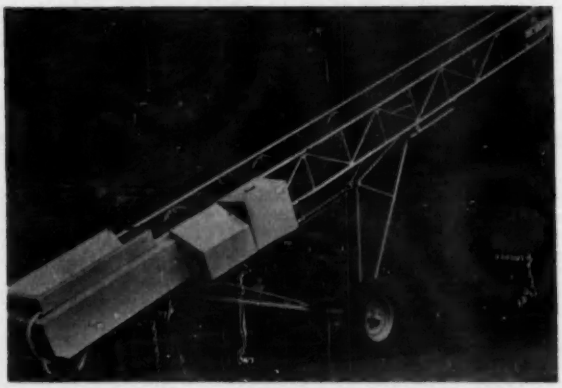
**Newman Industries Limited,** *Yate, Bristol*

Newman Industries Ltd., are to launch an entirely new range of low-cost fractional horsepower motors, and examples of the new motor, will be shown on their stand. Three standard types will be available, all with drip-proof enclosure; type "DS" split-phase with normal starting torque, type "DK" capacitor start for high torque duty and



*An example from the new range of low-cost fractional horsepower motors manufactured by Newman Industries Ltd. Split-phase and capacitator-start types are available, together with a special version for oil-burner duty. The new motors can be supplied with either solid or resilient mounting.*

type "DC" three-phase. In addition, Newman have designed a special version of the motor for oil-burner duty, which although basically similar to the others in the new range, has been designed specifically for the purpose, and incorporates a number of exclusive features. The most important of these is that the motor is fully enclosed yet small and compact and has NEMA flange fixing. Standard 50 c/s motors are wound for 230-volts and built to BS.170 with 50 deg. C. temperature rise. However, the motors are in NEMA frame sizes and if required can also be wound for 115-volts, 60 c/s, 40 deg. C. or 50 deg. C. temperature rise, to suit the U.S.A. and Canadian markets. Ratings immediately available are ½, 1/6 and ¼ h.p. at 1,500 r.p.m. (50 c/s), 1,800 r.p.m. (60 c/s) synchronous speeds. Other motors on show will be the new "Thoroughbred" single-phase motor introduced earlier this year; double-air circuit totally enclosed motors; vertical solid and hollow shaft pump motors; explosion and flameproof motors; gasworks and ordnance factory motors; and various sizes of standard totally enclosed and drip-proof motors.



*The new portable bulk piler manufactured by Thos. W. Ward Ltd., which is used extensively for stock-piling materials such as coal and coke.*

**The Plessey Co. Ltd.,** *Ilford, Essex*

A comprehensive display of hydraulic pumps, valves and rams will be exhibited by Plessey Co. Ltd. The company's hydraulic pumps are fitted with patented pressure-loaded bearings which ensure high efficiency at operational pressures up to 2,500 lb. per sq. in. Although manufactured only in four basic sizes, the arrangement of gears and bearings can provide 18 graded variations of output from 0.27 g.p.m. to 42 g.p.m. Standard straight and elbow port adaptors give a choice of five different pipe positions for inlet and outlet ports. Hydraulic rams to be featured will include single-acting, double-acting and positive displacement types. Piston rods used in all Plessey rams are hard chrome-plated for protection from corrosion and damage in service. Valve exhibits will include the Plessey 10S for single service, a similar dual service design, and a recently introduced poppet-type valve. The Plessey flow-divider will also be among the exhibits.

**Redler Conveyors Ltd., and Conveyors (Ready Built) Ltd.,** *Dudbridge Works, Stroud, Glos.*

The Redler "En-Masse" and "R.B." conveyor systems which will be featured on this stand are applicable to all industries where powdered or granular materials are handled in capacities from a few pounds to hundreds of tons per hour. The actual exhibits on view will include a circuit conveyor delivering material at various points and re-circulating the surplus; a Redler elevator conveyor handling to and from this circuit; circular and rectangular bin dischargers both mechanical and vibratory; "R.B." standard elevators and conveyors; a natural-frequency conveyor; control equipment; and a mobile pneumatic "GrainVayor."

**Riley (IC) Products Ltd.,** *19, Woburn Place, London, W.C.1*

This company will be exhibiting on the same stand as their associates International Combustion Products Ltd. Representative "Syntron" electric vibratory machines will be shown, including the heavy-duty back magnet feeders used for coal handling; and the light-duty feeders for free flowing materials. Bowl-feeders will also be shown handling small component parts and delivering them one at a time, the right way up, at controlled speeds.

**Simon Handling Engineers Ltd.,** *Cheadle Heath, Stockport, Cheshire*

Simon Handling Engineers Ltd. will show a continuous bulk materials-handling installation controlled by the Select-O-Weigh automatic proportioning system which, on this occasion, is designed to automatically vary the proportion of four different materials. This working unit will include a container handling plant, and a pneumatic materials handling plant incorporating a Simon Junior sifter. Control of automatic proportioning is by punched card, and a solenoid-operated typewriter is linked to the system to record every weighment.

**Tubewrights Limited,** *Egginton House, 25, Buckingham Gate, London, S.W.1*

Tubewrights Ltd., a subsidiary of Stewarts and Lloyds Ltd., will be exhibiting a representative range of products, including stacking-post-pallets, collapsible-crates, stillages of various designs, and their new patented Markussen pallets. A section of adjustable tubular steel racking will also be on view. A comprehensive model will be used to illustrate dockside handling of materials, including pallets, crane-jibs, gangways, roof-trusses and towers of tubular design. In model form also will be shown Usk and Brook footbridges, together with a large model floodlighting tower suitable for stockyards and sidings.

**Thos. W. Ward Ltd.,** *Albion Works, Sheffield*

Thos. W. Ward Ltd. are well known as manufacturers of all forms of conveyor and stackers for bags, boxes and packaged goods. Of particular interest on their stand will be a portable bulk piler of a type used extensively for stockpiling materials such as coal and coke. This is of welded tubular construction, and is powered by a petrol engine (alternatively, diesel engine or geared electric motor), the drive being through sprockets and precision-type roller chain, with the crown pulley mounted on a polished steel shaft running in permanently sealed self-lubricating type bearings. The belt is 18-in. wide, running on 2½-in. diam. idlers at 26-ft. centres and operating at 200-ft./min. The discharge height is 12-ft. 6-in. (fixed) or adjustable from 6-ft. 3-in. to 12-ft. 6-in.

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## NEW BRITISH STANDARD

B.S. 2742C is the British Standard version of the Ringelmann chart by means of which a visual assessment can be made of smoke emission from industrial chimneys. This method, first devised by Professor Ringelmann in Paris at the end of the last century, has been made the basis of assessing conformity with legislation under the Clean Air Act which becomes effective on June 1. The chart published by B.S.I. will provide a standard yardstick for use in connection with the new legislation. The Act forbids pollution of the air by "dark smoke," the definition of which is smoke as dark as or darker than Shade 2 on the Ringelmann chart. The chart, printed on white board, consists of five 10-cm. squares ranging from No. 0, which is left white to indicate "no smoke," to No. 4, which is criss-crossed with thick, black lines to simulate black smoke. A black strip above the No. 4 square assists quality control during printing of the chart. In practice the density of smoke emitted by a chimney is estimated by comparing the smoke with a Ringelmann chart held at such a distance from the observer that the black lines on the chart seem to merge into the white background producing, for each shade, an apparently uniform shade of grey. In producing the new British Standard chart, a board has been chosen which will not be affected by water vapour in the atmosphere. Special care has been taken in the printing to achieve a high degree of accuracy. In addition to B.S. 2742C, a separate publication "Notes on the use of the Ringelmann chart" (B.S. 2742) has been issued which users of the charts will find useful to have for reference.

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**Spencer-Bonecourt-Clarkson Ltd.,** 28, Easton Street, London, W.C.1, have issued a new publication (No. 1684) entitled "Steam From Exhaust Heat." The publication describes various applications of Clarkson boilers of the Thimble Tube, Composite, Begat and Gycentric types. The main applications of the Clarkson boiler when arranged for waste-heat recovery is in connection with marine diesels—its shape and general layout being ideal for siting in the casing above the engine or engines. Units of the Spencer-Bonecourt range referred to in the publication are the S.B. Fine-tube boilers, exhaust-gas water heaters, cross-tube heaters and certain concentric boilers. The publication has numerous line and half-tone illustrations.

**The Central Electricity Generating Board** have indicated their intention of placing an order for two 550-MW turbo-generators, with their associated condensing and feed-heating plant, with **C. A. Parsons & Co. Ltd.** The machines are believed to be the largest in the world to be ordered, and are for the projected Thorpe Marsh power station in Yorkshire. Operating steam conditions will be 2,300 lb./sq. in. pressure, 1,050 deg. F., with reheating to 1,050 deg. F. The value of the contract will be approximately £5,000,000. As we mentioned in the March issue of this journal, the boiler units to steam these 550-MW sets, will each have a c.m.r. of 3.75 million lb./hr., and will be constructed by International Combustion Ltd. It is anticipated that the first complete 550-MW boiler/turbine unit will be in commission at Thorpe Marsh power station by March, 1963.

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It is stated by the **Amber Chemical Co. Ltd.,** 11A, Albemarle Street, London, W.1, that tests have shown good results in using a new combustion additive with solid fuels. This additive, known as "Amber SSR115," was given a four-week, full-scale trial in seven Babcock & Wilcox boilers in a large installation. It showed a reduction in sulphur corrosion, greater boiler availability and improvement in heat transfer by removing existing deposits and slagging, a reduction of some 50 per cent. in $SO_3$ formation, and a reduction in stack emission. The additive, in the form of a fine powder, was fed directly into the combustion zones of the boilers through special injectors at a rate of 2 lb. per ton of fuel burnt on the chain grate stokers.

* * *

The rust-inhibiting properties of calcium plumbate were discovered by **Associated Lead Manufacturers Ltd.** in 1941, and after the war a calcium plumbate pigment was marketed by the company under the trade name "Caldiox." They also manufacture a rust-inhibiting paint, "Rustodian," using this pigment. We were recently invited to see a colour film showing, step by step, the discovery and development of the pigment, and of "Rustodian." An animated diagrammatic sequence explained in simple terms the theory of the electrical origins of corrosion, and showed how a calcium plumbate pigment paint inhibits rust, forming a protective layer over the calthodic as well as the anodic areas which exist in any piece of steel.

A new zero-energy reactor is now operating at the **Atomic Energy Research Establishment** at Harwell. Known as "Hazel" (Homogeneous Assembly—Zero Energy), this reactor uses enriched uranium fuel in the form of a salt of uranium curanyl fluoride which is dissolved in the heavy water used as a moderator. The core of the reactor is a stainless steel cylinder 7-ft. high by 2-ft. in diam., surrounded by a graphite reflector. The fuel solution is pumped into the cylinder from two nearby storage vessels. The system is controlled by adjusting the level of the fuel solution in the reactor vessel and by moving a vertical neutron-absorbing cadmium plate into the gap between the steel cylinder and the graphite reflector. Two cadmium plates similar to the control device are used as "shut-off" rods: two additional "shut-off" rods can be dropped vertically into the fuel solution in the reactor vessel. The reactor will be operated at a power of less than a watt and cooling is not necessary. "Hazel" will be used to obtain basic nuclear information. An earlier system at Harwell, ZETR (Zero Energy Thermal Reactor) was used to study solutions of nuclear fuel in ordinary water.

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**Mr. C. H. Flurscheim,** B.A., M.I.E.E., Mem.A.I.E.E., chief electrical engineer of Metropolitan-Vickers Electrical Co. Ltd., has been appointed a director of the company. In 1945 Mr. Flurscheim became assistant chief engineer, and in 1949 chief engineer, switchgear department. He was appointed assistant chief electrical engineer of the company in 1953 and became chief electrical engineer in February, 1957.

* * *

Causeway Reinforcement Ltd., 66, Victoria Street, S.W.1, announce the appointment of **Mr. Desmond Bowditch** to the board of the company. Mr. Bowditch joined the company as general manager in 1957, from the Henry C. Stephens Ltd. Group of companies, where he was also general manager. Causeway Reinforcement Ltd. is a member of the Amber Group of companies which includes Amber Chemical Industries Ltd., Amber Chemical Co. Ltd., and Charles H. Windschuegel Ltd. The company manufactures "Hexmetal," a fabrication of steel-walled honeycomb cells for use as a reinforcement for industrial linings, heavy duty floors, and other surface armour applications.

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# RECENT Equipment AND Accessories

**Induced-draught cooling towers**

Mechanical cooling towers of the induced-draught type provide a means of water cooling which is claimed to be efficient, economical to operate, and which occupy the minimum of space. In this design of structure the fans are located at the top, the air entering the base of the tower at a relatively slow speed and leaving from the top at high velocity. The advantages of this method are that the incoming air is circulated more evenly through the packing, and recirculation is not likely to occur. Film Cooling Towers (1925) Limited have developed a method of packing for induced-draught cooling towers which they claim provides the greatest possible degree of heat transfer, for a low capital outlay. This system, known as "Film Flow," distributes the liquid evenly over the packed area of the tower and allows the cooling air unimpeded access to all parts of the packing. The water is led to the tower either in a closed pipe, or in an open culvert from which it

*Fig. 1 (left). A model showing details of the film flow grid-packing system for induced-draught cooling towers. [Film Cooling Towers (1925) Ltd.]*

is discharged into secondary troughs through orifices specially designed to prevent splashing. From the secondary troughs it is fed into weir-type spreader-troughs running the entire length or breadth of the tower, and at a pitch of 6-in. The spreader-troughs, which have specially-shaped notches at 2- or 4-in. intervals, rest on the top layer of the tower filling. The filling comprises a number of horizontal trays of parallel laths, the direction of each layer of laths being at right-angles to the trays above and below it. The effect in plan view, is of a grid composed of 2-in. square network, and the water upon being discharged through the trough walls flows down the grid packing in an even film changing direction through 90° every 2-in. throughout the whole depth of the tower. The entire surface of the packing is, therefore, evenly wetted, providing a high heat-exchange co-efficient, which, together with the fact that the cooling air has a relatively unimpeded flow throughout, effects an economy in the cost of the power to drive the fans. Also by completely avoiding the formation of water drops, there is a smaller loss of water by entrainment, and the use of baffle plates and drift eliminators is unnecessary. Probably the most important feature of the Film Flow system, however, is the saving in space, due to the fact that the packing depth can be reduced in some cases by as much as 50 per cent. of the space required by the normal drip-bar packing system. This is reflected in both lower capital costs and in considerable saving of the power required to obtain the pumping head. Induced-draught towers incorporating the Film Flow packing system can be constructed with shells of reinforced-concrete, asbestos cement tile, steel or timber according to requirements and local conditions. [*Film Cooling Towers* (1925) *Ltd., Kew Bridge, Brentford, Middlesex.*]

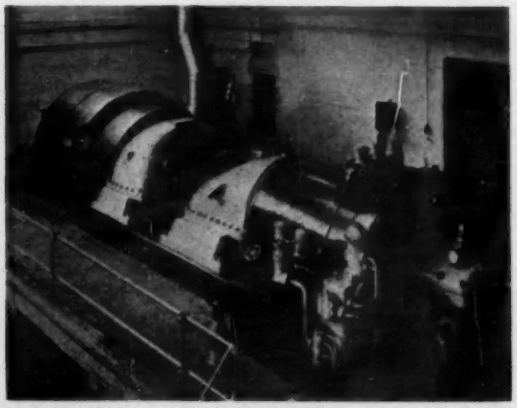


*Fig. 2 (right). The Sulzer axial blower driven by an Oerlikon condensing turbine installed at the Margam "B" works of the Steel Company of Wales. [Sulzer Bros. (London) Ltd.]*

**Blast-furnace blower for steel-works**

A Sulzer-Oerlikon blast-furnace blower set has now been in service for two years in the Margam "B" works of the Steel Company of Wales, and in view of the excellent results obtained with this equipment, the company has now ordered a second set of the same size, but for a somewhat higher pressure. The order covers the Sulzer axial-type blower (which will supply a maximum of 140,000 cu. ft./min. at 35 lb./sq. in. final pressure) and a direct-coupled condensing turbine of 12,000-kW maximum output built by the Oerlikon Engineering Co., Zurich. This will be the most powerful axial blower so far built by Sulzer Brothers, and, in fact, one of the biggest so far used for blast-furnace operation anywhere. The furnace to which the set will supply the requisite blast is also one of the largest in the world, with a hearth diameter of 30-ft. and a pig-iron production of about 10,000-tons per week. [*Sulzer Bros. (London) Ltd.*, 31, *Bedford Square, London, W.C.*1.]

**Ratchet-assisted tube-bending machine**

The Tubela Engineering Co. Ltd. have introduced a new model (T.3.R.1) ratchet-assisted tube-bending machine. A lighter version of the company's 2-in. capacity model, the new machine has a capacity of ¼-in. to 1¼-in. copper tubes or ⅜-in. to 1¼-in. o.d. electrical conduit. The T.3.R.1 is bench-mounted, or may be used with the Tubela S.1 stand. Complete back roller pressure control, usually found only on the more expensive type of tube-bending machine, has been incorporated. By removing only one locating pin it is possible to convert the ratchet mechanism into the normal "direct pull" for bending smaller diameter tubes.

Full ratchet control is essential where careful and accurate bending is required, especially in the larger dia. tubes and with the 16 to 1 lever advantage, it is possible with this equipment for one operator to easily bend any length of tube either on a bench, or when stand mounted. (*Tubela Engineering Co. Ltd., Fowler Road, Hainault, Ilford, Essex.*)

**"Telicator" flow-indicators**

Sir W. H. Bailey & Co. Ltd. have been appointed as sole distributors for the flow-indicating equipment produced by the Dukes and Briggs Engineering Co. This equipment at present comprises only "Telicator" visual-flow indicators, but other models will shortly be available to provide a full range of flow indicators to cover all requirements. The

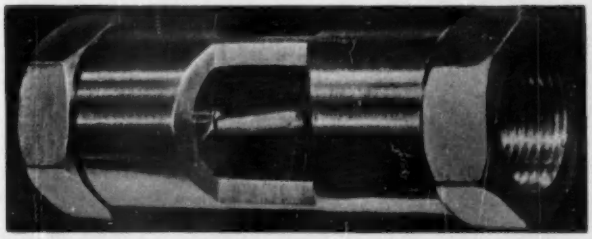


*Fig. 3. The "Telicator" visual flow indicator. (Sir W. H. Bailey & Co. Ltd.)*

"Telicator" is a simple, compact unit designed for high- or low-pressure systems, and can be successfully used for extremely high or low rates of flow at any viscosity. Comparative flow can be readily gauged by a glance at the rate at which the rotor is revolving—this rotor being clearly visible through its cartridge case of perspex or glass. Complete reliability is afforded by the simplicity of the unit, with its sprung-jewelled bearings and strong metal external casing, while cleaning is facilitated by the design of the cartridge. The indicator will have applications in all branches of industry, including forced-lubrication systems and water supplies for cooling purposes. Apart from the standard range for single- or multi-circuit indications, designs can be produced for individual requirements, while a special model is available for use with opaque liquids. (*Sir W. H. Bailey & Co. Ltd., Patricroft, Manchester.*)

**New glandless stop-valve**

Meynell & Sons Ltd. have now made available a new design of stop-valve suitable for controlling the flow of almost any fluid and gas up to a maximum temperature of 100 deg. C. Known as the "Rayon-Patent" stop-valve the upper part of the rubber valve is so shaped that the movable parts of the stop-valve remain isolated from the liquid, completely eliminating the need for packing glands. The design of the clack and clack seat, and the complete elimination of pressure on that part of the clack separating the fluid controlled from the working mechanism, ensures that the valve will remain in service for long periods without the need for replacement. The valve is available either screwed or flanged, and is suitable for all liquids including acids, corrosive fluids and brine. The body can be supplied in cast-iron, malleable-iron, bronze, aluminium or lined with hard rubber or plastic. The method employed in lining the valve body (for which a patent has been applied) ensures that the "Rayon-Patent" is also suitable for use in absolute vacuum. With the introduction of a nylon clack, the "Rayon-Patent" valve is claimed to be suitable for the control of petrol, oils, solvents and many materials that previously have had a severe effect upon rubber or synthetic rubber, and which have either precluded the use of rubber or synthetic rubber in valves, or where the life of the rubber

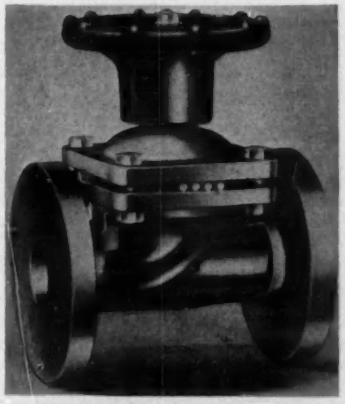


*Fig. 4. The Meynell glandless stop-valve for controlling a fluid or gas, at temperatures up to 100 deg. C. (Meynell & Sons Ltd.)*

or synthetic rubber in contact with the fluid or gas has been very short. In addition, the nylon clack can be used in certain hot-water applications which obviates the need for using packing glands or stuffing boxes. Other features of the valve include :—perfect sealing due to the fact that the rubber clack fits exactly into a formed depression avoiding distortion of the valve clack; no danger of rapid wear when using for regulating purposes; clear, unrestricted way, reducing pressure drop to almost nil; clear indication from outside when the valve is opened or closed; exceptionally long life with very little maintenance costs. (*Meynell & Sons Ltd., Montrose Street, Wolverhampton.*)

**A new drip-proof motor**

A new range of drip-proof motors (type C) from ¼-50 h.p., has been produced by Brook Motors Ltd., to British Standard Draft Specification C.W. (ELE) 6246 for dimensions, and to the amended B.S. 2613 for electrical performance with Class "E" insulation. Particular care has been given to the design of the motor ventilation system. The cooling air stream is drawn into the ends of the motor, guided by pressed-steel air deflectors, which also serve as additional protection for the end windings, and after passing over the windings, is expelled through openings in the yoke casting. The company have made exhaustive tests on the prototypes of their new Class "E" machines and have, they claim, succeeded in obtaining better starting performance and remarkably cool running, well below the limits imposed with full output. The terminal box is of cast-iron, with additional space for connecting power cables to the plastic moulded terminal board. The box can be rotated to four positions as also can the end-shields, making mounting on floor, wall or ceiling a simple matter, while retaining the full protection of the drip-proof design. Shafts are made from 40-ton tensile steel, while the rotors have integrally-cast fans and the whole shaft assembly is dynamically balanced on electronic machines to give quiet running on pre-loaded medium ball-bearings. The new types are more compact in size, easier to fit in confined spaces, lower in weight for size ratio with resultant lower freight costs, and most important—lower in first cost, owing to the considerable savings made in the use of basic material. A range of motors similar in appearance, except for smaller diameter shaft extension, are being produced to the NEMA (American) re-rate specification. These motors have Class "A" insulation, and are made for use on 60 c/s supply. They are already being sold in the U.S.A. through Brook Motors Ltd., own subsidiary company in Canada, and their agents in Canada. (*Brook Motors Ltd., Empress Works, Huddersfield.*)

**Turbo-alternator at National Physical Laboratory**

A General Electric Co. Ltd. 650-kW geared turbo-alternator set has recently been installed at the National Physical Laboratory, Teddington, as part of an integrated scheme for supplying the heating requirements of the laboratories and at the same time economically augmenting the Electricity Authority's supply to the site. The usual method of operating the set is in parallel with the South Eastern Electricity Board's supply, but provision is made for independent working so that in an emergency, the essential services of the laboratory can be maintained. The turbine, with inlet steam conditions of 210 lb./sq. in. at 540 deg. F., is designed for back-pressure operation, exhaust steam at 40 lb./sq. in. being desuperheated and delivered to calorifiers for central heating purposes. In order to ensure that the heating requirements can be met under all conditions of electrical load, a by-pass line with a reducing valve and desuperheater is fitted so that additional steam for space heating can be supplied (via the reducing valve) should the back-pressure of the turbine fall to 1 lb./sq. in. below the normal value. When the set is synchronised with the grid supply, the back-pressure is maintained at a constant value by a pressure regulator, the electrical output varying according to the demand for heating steam. It is also possible to operate the turbine under speed-governing conditions when isolated from the grid, with the back-pressure correctly maintained by high-pressure steam supplied through the reducing valve. The alternator, driven through 7,000/1,500 r.p.m. speed-reducing gears manufactured by the David Brown Corporation Ltd., is rated at 650-kW maximum (618-kW normal) 3-kV, 50 c/s. (*The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.*)

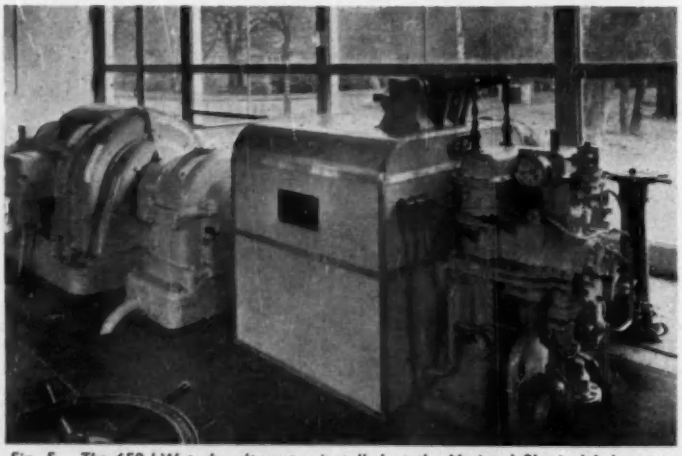


*Fig. 5. The 650-kW turbo-alternator installed at the National Physical Laboratory, Teddington. (The General Electric Co. Ltd.)*

**Industrial X-ray equipment**

The latest addition to the Marconi Instruments Ltd. industrial X-ray range is the type TF 1597, a 110-kVp apparatus, designed for 200-250 volts a.c. operation. This basically consists of three units—h.t. generator, control unit and tubehead, the method of mounting these units depending upon individual requirements. Each of the basic units is portable, which makes the apparatus suitable for a wide range of applications in the field of non-destructive testing. The h.t. generator is oil-immersed in a welded-steel tank. It comprises the h.t. transformer and an X-ray tube filament transformer. Two 62.5 kVp cable sockets provide the output to the X-ray tube, while the input from the control unit is taken to terminals at one end of the tank. When supplied as a portable unit, the h.t. generator is fitted with a pair of carrying handles, which are conveniently placed so that the control unit can be rested across the top of the tank when in use, or for storage. The control unit is housed in a rectangular case with a sloping panel on which are mounted all controls and meters. A stout leather carrying handle is provided to facilitate portability. The hinged top and front panel of the unit may be swung down to gain access to the components and also to the fuses. A synchronous motor-operated self-resetting timer is incorporated, and the customer can make his individual choice from a wide selection of ranges. The X-ray insert tube normally supplied can be operated up to 110-kVp, 10-mA, and provision is made for water-cooling at the higher ratings, circulation being derived from the normal tap supply. Standard tubehead mountings at present available are :—(1) A static tube-stand, fitted with four telescopic legs and providing facilities for angulating the tubehead about its short axis. (2) A vertical column tubestand, mounted on a castored base, which is large enough to contain the h.t. generator and the control unit ; the latter is removable for remote operation, if required. (3) A fluoroscopic cabinet, which houses the complete equipment and has a specially-constructed control panel built-in. Facilities are also provided for radiography with this arrangement. (*Marconi Instruments Ltd., St. Albans, Herts.*)

**Furnace for light-alloy castings**

A new, forced-air circulation furnace for annealing, solution heat treatment and ageing of aluminium alloy castings has recently been installed by Royce Electric Furnaces Ltd., for Cambrian Castings Ltd., Hirwaun, Aberdare. This is one of the company's standard range of VFC-type furnaces which are available in sizes from 10-in. dia. × 10-in. deep to 36-in. dia. × 60-in. deep ; they may be used for tempering, preheating or similar heat-treatment at temperatures up to 750 deg. C. To achieve close control and uniformity, high velocity air circulation is passed over the heating elements housed in a baffled annulus surrounding the work chamber, the heated air passing through the charge on return. Heat is, therefore, transferred to the charge by forced convection, giving a uniform and rapid heating cycle. Heating elements are of 80/20 nickel chromium, suspended directly in the air stream and shielded from the work chamber to eliminate direct radiation. Air circulation is produced by a high-velocity centrifugal fan unit mounted in the base of the furnace. The air impeller is specially designed to displace, under all temperature conditions, the maximum volume of air with widely varying conditions of pressure which may be imposed by different types of charge and density of loading. An air-cooled motor with an extended spindle of heat resisting steel gives a trouble-free performance for the combined duty of high speed and elevated temperature. Charge baskets are provided and heat-resisting castings are fitted in the base of the furnace chamber to support heavy

loads. The lid is easily operated manually by a lever-linking mechanism which locks the lid in the raised position for moving to one side. A back-post pivot fitted with ball-bearings makes this a rapid and simple operation and therefore very suitable for solution heat treatment. To meet A.I.D. requirements, the control gear includes an Electroflo automatic indicating controller, and three-point recording instrument. A delta-star switch is included to reduce the rating to one-third for operation in the lower temperature range. An additional instrument is provided as an over-riding excess temperature cut-out. (*Royce Electric Furnaces Ltd., Walton-on-Thames, Surrey.*)

**Automatic drill equipment**

The Maxam Woodpecker drill unit recently introduced by the Climax Rock Drill & Engineering Works Ltd. has been designed to speed up drilling operations. This air-operated, $\frac{5}{8}$-in. unit incorporates hydraulic feed control, automatic chip clearance, and a rapid sensing approach. The forward feed speed is infinitely variable by hydraulic control and there is a rapid return stroke. The unit will drill to a preset depth against a positive stop, and will then return to the starting point, thereby clearing chips from the hole and drill flutes. It then automatically re-advances rapidly until the drill contacts the bottom of the hole being drilled, and again drilling continues at the controlled rate of feed. On the returning cycle, the air supply to the drill ceases, thus keeping air consumption to a minimum. On its forward stroke the drill recommences to rotate. This peck action continues throughout the whole operation and on reaching the required depth of drilling the unit finally retracts to its starting position and stops. The depth of peck is infinitely variable, and the number of pecks depends on the preset depth of peck and the depth of hole being drilled. If required, the drill can be made to rotate slowly during the returning cycle and in its reset position. It can also function without the peck action when this is desirable. The chuck capacity is 0-$\frac{1}{2}$-in. The standard chuck speed is 2,400 r.p.m. but alternative gear-boxes are available for spindle speeds of 540, 970, 4,000 and 6,000 r.p.m. Two standard units are produced, type MX.588 having a 2-in. stroke, and MX.589 having a 4-in. stroke. The drill is controlled by a Maxam 4-way double solenoid-operated valve, type PE.-84-41-10, which is normally recommended to work from a supply transformed to 12 V a.c. This valve, however, can be supplied with coils suitable for most standard a.c. or d.c. voltages. In addition, a suitable relay is necessary and can be supplied with the unit. The unit can be mounted in any position. (*Maxam Division, Climax Rock Drill & Engineering Works Ltd., Carn Brea, Cornwall.*)

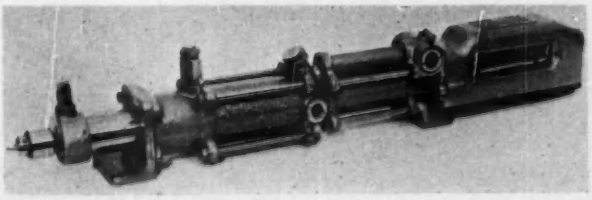


*Fig. 6. The Maxam drill unit. (Climax Rock Drill & Engineering Works Ltd.)*

**New Fireproof Insulation Board**

A new fireproof insulation board known as "Ubesto," was introduced at the recent Thermal Insulation Exhibition by Universal Asbestos Manufacturing Co. Ltd. "Ubesto" is an incombustible panelling board. It is grouped in Class 1 under B.S. 476, 1953, and has a high degree of resistance to direct flame impingement. In a test in which it formed three walls of a fire-box, the $\frac{1}{4}$-in. rolled steel angle box frame was at bright red heat and the "Ubesto," while in direct contact with incandescent coke, was sprayed with cold water. The company claim that throughout the 3-hour test the boards remained unwarped and did not crack, and when dismantled after cooling they had only slight discolouration and slight surface flaking where they had been in direct contact with the fire. Conforming with the requirements of B.S.S. 1785, the new material is a low-density board with a high asbestos fibre content, and a thermal conductivity or "K" factor of 0.80. It is of entirely mineral composition and is both rot-proof and vermin proof. Water absorption is 80 per cent. of its own weight, without structural deterioration, when immersed for 24 hours, and it may be used in humid conditions likely to cause condensation. "Ubesto" is manufactured in various thicknesses and is suitable for roof and wall linings, and for partitions. It may be supported on light T-sections at not more than 2-ft. vertical and 4-ft. horizontal centres. The material is particularly suitable for use as the inner skin in Universal "sandwich" constructions, or as a ceiling fixed to Universal battened decking. It has a natural clean white finish, and where decoration is required good results are said to be obtained with synthetic resin or chlorinated rubber based paints, with water based distempers or emulsion paints. Paints based on vegetable oils are not recommended for this purpose. (*Universal Asbestos Manufacturing Co. Ltd., Tolpitts, Watford, Herts.*).

**New Equipment to Manufacture Electric Fusion Welded Pipe**

A Quasi-Arc/Torrance continuous edge former and seam welder, which forms the edges of the pipe and welds seams in one operation, has recently been installed at the Coatbridge works of Stewarts and Lloyds Limited for the manufacture of electric fusion welded pipes. The new equipment handles pipe from 18-in. to 50-in. outside diameter in plate thicknesses up to $\frac{3}{4}$ in. The pipe lengths are fed through the machine continuously, butted end to end, by a succession of drive rolls, power driven at an infinitely variable welding speed by a 7$\frac{1}{2}$ h.p. motor to give a range of welding speeds between 30 and 96-in. per min. As the pipe lengths, which have already been rolled into shape, enter the machine, the edges pass between two edge forming rolls mounted one above the other. These rolls break the plate edges to produce a circular pipe with a good fit-up between the faces of the joint to be welded. Five sets of edge forming and drive rolls are required for the complete range of pipe sizes. The machine is fitted with Unionmelt multi-power tandem welding equipment comprising two Unionmelt D.S.H. welding heads. The lead head is powered by a continuously rated 1,200 ampere d.c. rectifier power unit, and the trailing head by a 1,000 ampere a.c. transformer power unit, continuously rated at 800 amperes. A copper backing shoe is positioned on the underside of the joint underneath the welding heads, being mounted at the end of a cantilever arm suspended from the entry point of the seam welder. A circulating-water system is used to cool the copper shoe, which when in position, allows for the making of a completely penetrating weld. The machine is equipped with a continuous circulating system for welding powder. Internal welding equipment comprises a Unionmelt D.S.H. welding head with feed roll and

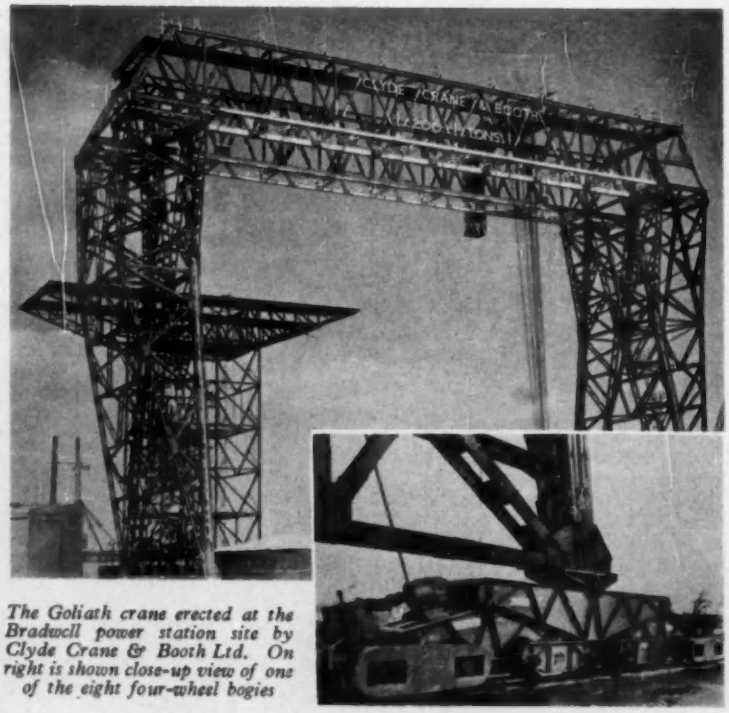
nozzle assembly for parallel electrode welding, mounted at the end of a boom 30-ft. in length. The boom remains stationary while the pipe is moved at welding speeds on a traversing roller bed. The main part of the boom is substantially rigid, but the end is supported by small rollers bearing on the bottom of the pipe. A closed circuit television system is used to enable the operator to see the line of joint ahead of the welding nozzle so that he can make any necessary adjustments. The principal advantage of the Torrance edge forming and seam welding equipment is claimed to be that it feeds pipe continuously through the machine with the minimum of interruption of the welding procedure. This enables an overall duty cycle of 80 to 90 per cent. to be achieved. With Unionmelt multi-power tandem welding, using d.c. on the leading head and a.c. on the trailing head, exceptionally high welding speeds are obtained with minimum edge preparation. An additional feature of the Torrance equipment is the forming rolls which break the plate edges as the pipe sections enter the machine. Considerable capital expenditure and labour costs are eliminated by the use of this method, since these rolls make it unnecessary to provide other machines (with their operators) for breaking the plate edges prior to rolling or press forming. (*Quasi-Arc Ltd., Bilston, Staffs.*)

**Low-resistance testing set**

In order to satisfy a growing demand for their instruments Evershed & Vignoles Ltd. have found it necessary to re-organise part of their factory for the purpose of increasing the production of the Ducter low-resistance testing set, a direct-reading instrument for measuring resistances from a few ohms down to one microhm. The complete Ducter comprises an ohmmeter, one pair of Duplex handspikes, one pair of single handspikes and an alkaline battery or cell. The movement is of the permanent magnet moving coils type, the moving element consisting of two coils rigidly secured at an angle to one another, and pivoted in spring-mounted jewels so that the coils swing in the annular gap between a fixed centre iron and the polar faces of a permanent magnet. Connections to the moving coils are made through thin ligaments exercising inappreciable control. The centre coil is connected across a shunt in the main circuit and the current in this coil is therefore proportional to the current in the resistance under test. The deflecting coil is connected across the resistance under test, and carries a current proportional to the potential drop. The polarity of the two coils is so arranged that the torques developed oppose one another. The position of the movement is, therefore, dependent on the ratio between the potential drop and the current, i.e. (by Ohm's law) on the value of the resistance being measured. The scale is calibrated directly in ohms or microhms. As the instrument is a true ohmmeter, its accuracy is unaffected by variation in battery voltage, and no adjustment is required, the instrument being always ready for use. (*Evershed & Vignoles Ltd., Acton Lane Works, Chiswick, London, W.4.*)

# GOLIATH CRANE FOR BRADWELL NUCLEAR POWER STATION SITE

A Goliath crane designed to lift a maximum load of 200 tons has been built on the site of the Bradwell nuclear power station by Clyde Crane and Booth Ltd., an associate company of Clarke, Chapman & Co. Ltd. who are in turn members of the Nuclear Power Plant Co., the group responsible for the construction of the new station. We were recently invited to witness the crane undergoing tests at Bradwell, where it will completely straddle each reactor building during all stages of construction, and be used extensively for the installation of heavy items of equipment. The crane is of the overhead girder type supported at each end by a leg mounted on eight four-wheel bogies. It consists of a normal type crab with two independent hoists which are mounted on a pair of twin girders, each one being provided with its own horizontal outrigger girder to give lateral stiffness. The girders are mounted on a pair of legs of similar construction, the main vertical loads being taken through pin-joints in order to get correct load transfer. The rear end of one leg is anchored to its corresponding girder, the rear end of the other leg being left free to float. In effect, this is a pendulum leg which can be made rigid as required. The base end of each leg is pin-jointed to equaliser beams which, in turn, transmit the load to the bogies. Hoisting equipment consists of standard crane spur hoist gearing housed in totally-enclosed steel gear boxes, the shafts running on ball and roller bearings. The barrels are of




*The Goliath crane erected at the Bradwell power station site by Clyde Crane & Booth Ltd. On right is shown close-up view of one of the eight four-wheel bogies*

steel tube construction, machine grooved and arranged to coil the rope without overlapping. Overwinding and overlowering switches are provided for each hoist. The load from each leg is transmitted through a main equalising beam which spreads the load to two other equalisers which, in turn, are connected to the bogies ; the attachment to the bogies is through a universal connection thus giving equal distribution of load over all the axles in any one leg. Bogies and equaliser beams are of fabricated steel construction, the wheels and axles are of rolled steel railway pattern running in phosphor bronze bushed bearings. Half the total number of axles, i.e. four axles in each leg, are driven through worm and spur gearing with coupling rods for transmitting the drive from the geared axle to its mating axle in the same bogie.

The crane is electrically controlled in all motions from an operator's cab which travels with the crab, and a 460-V d.c. electrical supply is provided by a 350-kW Crossley diesel generator. The bogies, each driven by a 20-h.p. motor run on a standard gauge railway line at a rate of 50 ft./min. when the crane is under maximum load (200 ton), and an indicator synchronised by "Selsyn" control is provided so that the operator can see to what extent the bogies at opposite ends of the track are being maintained in line. Should it be necessary to re-align the crane, one side may be driven separately. The main hoist is powered by two 50-h.p. motors and lifts the maximum load at 4-ft. 9-in./min. There is also an auxiliary hoist capable of lifting 30 tons at 33-ft./min. Traversing of the crab is by two 20-h.p. motors at 50-ft./min. The complete crane weighs 800 tons, and it was built in 14 months. High-tensile bolts were used in place of rivets for its construction, so that the entire unit can be dismantled and used again. Steelwork was supplied by Tees Side Bridge & Engineering Works Ltd.

## *KENT MOBILE EXHIBITION*

The George Kent Ltd. exhibition vehicle has already this year toured the Ruhr and the industrial centres of Belgium, and on returning to Germany in May it will take part in the ACEMA Exhibition at Frankfurt, where one of the principal Kent exhibits will be the recently introduced Commander KE high-speed electronic self-balancing temperature recorder, which will be shown working with a radiation pyrometer. Two more Commander models, a flow recorder-transmitter (pneumatic) and a flow-recorder-controller, demonstrate flow-ratio control using water-flow lines, while a further instrument in the range that can be seen as a working model is a combined flow, pressure and temperature recorder. A second example of flow-ratio control comprises an RTE ring-balance instrument fitted with a Mark 20 pneumatic-controlling unit, together with diaphragm control valves, and an RTE with a Mark 24 pneumatic transmitting unit. In the quality-control section of the display, oxygen analysis is demonstrated by a Multelec oxygen recorder and a Kent paramagnetic oxygen analyser. Also in this section is a single-point Universal pH recorder together with tank- and flow-type Universal pH primary elements (glass-electrode). A demonstration of pressure-recovery during flow measurement is provided by a special U-tube comparison unit consisting of miniature Dall and Venturi flow tubes and an orifice fitting. Kent mechanical meters are also on view, including a CM low-flow oil meter, and a Master water meter for industrial supplies. This display also includes a sectioned RSC rotary-shunt steam meter. Finally, Kent unit draught-gauges and an air-operated power cylinder are displayed, together with SB orifice fittings A more complete description of the Kent mobile exhibition was published in the January, 1958 issue of this journal.

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**W. C. Holmes & Co. Ltd.,** P.O. Box No. B.7, Turnbridge, Huddersfield, have issued a new brochure (publication No. 71) which gives details of the type-RB Holmes-Connersville positive air-blowers. A 12-in. size machine has now been added to the range, and these, together with the established 10-in. model, have a redesigned "H"-type casing.

**The Wilmot Breeden Group of Companies,** whose manufacturing interests include motor vehicle and gas turbine components, hydraulics and electronics, are sponsoring two Fellowships, each worth £1,000 per annum—one at the University of Birmingham and the other at the College of Technology. An unusual feature of these Fellowships is that the successful candidates will divide their time between the University or College and the Company. The terms of the Fellowship awards are so arranged that at any one time there will be a Wilmot Breeden Fellow working in association with the University and another with the College. The Fellowships will be advertised every year in March, in "odd" years in association with the University and in "even" years in association with the College. Each Fellowship will normally be held for a period of two years. A candidate for a Fellowship should normally have had two or three years research or industrial experience. He must be acceptable to the academic authority and would be expected to have an honours degree in a University in the British Commonwealth, a Diploma in Technology, or an equivalent qualification. An application for a Fellowship should outline a two-year investigation or project on which the candidate seeks to work. Full details may be obtained from Wilmot Breeden Ltd., 13-14, Oxford Street, Birmingham, 5.

* * *

**The Visco Engineering Co. Ltd.,** Stafford Park, Croydon, Surrey, have issued a new brochure (No. 579) dealing with their forced and induced-draught steel-shell water-coolers. A good deal of information relating to the construction and operation of these units is given, and throughout the publication a number of actual installations are represented pictorially.

* * *

**Paterson Engineering Company Ltd.** states that its address is now 129, Kingsway, London, W.C.2. (Telephone: HOLborn 8787.)

* * *

**Mr. T. Herd,** for the past 12 years manager of the Birmingham office of Brook Motors Ltd., has been appointed general manager of the London sales office of the company.

The Mond Nickel Fellowships Committee announced recently the award of Fellowships for 1957 to the following applicants :— (a) **Mr. E. J. Williams** (John Summers & Sons Ltd.) to study the research and production techniques, quality control and metallurgy of high quality, low carbon strip steel in the United Kingdom, the Continent, and the U.S.A. ; (b) **Mr. R. J. D. Acheson** (Mufulira Copper Mines Ltd.) to study the extraction and refining processes for copper and allied metals, with particular reference to economic aspects. The Mond Nickel Fellowships Committee now invites applications for Fellowships of an approximate value of £900 to £1,200 for 1958. Fellowships will be awarded to selected candidates of British nationality with degree or equivalent qualifications to enable them to obtain wider experience and additional training in industrial establishments, at home or abroad, to make them more suitable for future employment in senior technical and administrative positions. Each Fellowship will cover one full working year. Applicants will be required to state details of the programme they wish to carry out. Particulars and forms of application are available from :— The Secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1. Completed application forms are required by June 1st, 1958.

* * *

**Walker, Crosweller & Co. Ltd.,** Cheltenham, have issued a new pamphlet illustrating their "Arkon" flow indicators. Incorporated are the firm's latest indicators (sizes ¼-in. to 1-in.) which can be adjusted for high or low velocities of flow. "Arkon" indicators are used to show the flow of cooling water, lubricating oil, cooling oil, gas or air, etc.

* * *

A new publication of approximately 50 pages (No. 52) and entitled "Introduction to Copper," has just been issued by the **Copper Development Association.** It tells in clear and simple language where copper is found, how it is extracted from its ores, how it is fabricated, and the various uses to which it is put and reference is made to the many important copper alloys. Like the other C.D.A. publications, "Introduction to Copper" is issued free on request to the association.

# OVERSEAS Steam Engineering Practice

*Abridgments of recent articles in the colonial and foreign technical press, concerning design and progress in the technique of steam generation and power plant equipment*

### New 100-MW thermal power station

When completed within the immediate future, the Yarmouth power station of the Central Maine Power Co. will have an output of 100-MW, and will raise the capacity of the company's system to 560-MW, an increase of 18 per cent. The plant will comprise two Foster Wheeler steam generators each with an m.c.r. of 490,000 lb./hr., the steam pressure being 1,360 lb./sq. in., and the steam temperature at the superheater outlet, 950 deg. F. Each unit will supply steam to a 50-MW General Electric 3,600 r.p.m. tandem-compound turbo-alternator. The boilers are of the single-drum dry furnace-bottom type (including water-filled ash-pits), and designed for initial oil-firing and future pulverised-coal firing, each unit being equipped with six Foster Wheeler intervane-burners fitted with wide range mechanical atomising oil guns suitable for No. 6 fuel-oil. Each unit has a two-stage, completely-drainable convection superheater and spray-type steam-temperature control system which maintains final steam temperature over a load range from 356,000 to 490,000 lb./hr. An extended-surface economiser raises the feedwater temperature from 430 to 485 deg. F., when using oil as fuel, and a regenerative-type air pre-heater increases the air temperature from 80 to 460 deg. F. The units are arranged for balanced-draught firing. The 27,200 cu. ft. furnaces are completely water-cooled, the water walls being of finned-tube design and consisting of 3-in. tubes on 3¾-in. centres, with fins welded between each tube the full height of the wall. These welds are of the full-penetration type and the assembly gives added heat transfer over the more conventional design, as well as providing a gas-tight closure or inner casing. Behind the steel finned-tubes is plastic insulation, followed by 3-in. of mineral wool block insulation and an outer sheathing of 22-gauge sheet metal. All the boiler enclosures, with the exception of the rear wall, were prefabricated, thus materially reducing construction time and costs. There were 24 shop-fabricated panels for each unit, the largest of which measured 14-ft. by 40-ft., including headers. The others were 12-ft. by 30-ft. For future coal delivery to the station, which is situated on Cousins Island, about one mile off the Maine coast, a 440-ft. jetty has been constructed. (*Heat Engineering*, Vol. 32, No. 6, pp. 90/91.)

### Tandem cross-compound quadruple exhaust turbine

A new design of cross-compound steam turbine design arrangement, developed for the Public Service Electric & Gas Co. of America, and which departs from the 1,800 r.p.m. shaft design usually associated with cross-compound machines, was announced recently. This tandem cross-compound, quadruple-exhaust arrangement operates both shafts at 3,600 r.p.m., and is designed for ratings up to 300-MW, with steam inlet pressures from 2,000 to 3,000 lb./sq. in. and inlet temperatures of 1,000, 1,050 or 1,100 deg. F. This arrangement is said to be applicable to units of 500-MW capacity, though this rating would require sextuple-flow exhaust. The major advantage of the 3,600/3,600 r.p.m. design is the near duplication of the two parallel turbo-alternators—the only difference being that one has a h.p. turbine element, the other an i.p. element. Other components—l.p. elements, generators and associated switchgear—are the same for both parallel units. Steam flow is through the h.p. turbine to the reheater; from there reheated steam is taken to the centre of the i.p. turbine and discharged in equal proportions to the two double-flow l.p. turbines which exhaust to a common condenser. With this machine, the load can be balanced between the two shafts at a selective point by the correct selection of reheat pressure and pressure at the inlet of the l.p. elements. Identical generators divide the load evenly at the rated 290-MW output. (*Power*, Vol. 102, No. 2, p. 79.)

### Spherical-head feedwater heater

A new type of all-welded feedwater heater, which has a spherical water-way integral with the tubeplate and heater shell, is to be supplied in connection with two 2,400,000 lb./hr. boilers now under construction for the Consolidated Edison Co. of America. The spherical water-way will be 5-ft. dia., and the feedwater at a pressure of 3,000 lb./sq. in. will make two passes through the U-tube bundle. A curved pass-partition, which allows for thermal expansion, separates the inlet and outlet passes in the sphere. The partition-plate can be removed through a pressure-sealed manhole. The tube-plate, an integral part of the sphere, is approximately 4-ft. dia., and 10-in. thick, while the tubes which are manufactured from 18-gauge Monel nickel copper, are ⅝-in. in dia., the tube-bundles being approximately 40-in. dia. and 30-ft. long. Each unit has a heating surface of 7,700 sq. ft. Nozzles for steam inlet and condensate outlet are welded to an enlarged section of the shell known as the annular distributor, while stainless-steel impingement surfaces opposite the nozzles avoid eliminating tubes to accommodate a bolted impingement-plate that may corrode and break away. Incoming superheated steam passes through a jacketed chamber in the annulus. The jacket, surrounded by saturated steam, prevents superheated steam from contacting the tube sheet, distributor or shell, thus reducing extreme temperature gradients across tube joints and shell connections. The steam flows through a desuperheater section into the condensing zone. Condensate flows through a subcooling zone before leaving the heater. Welded shrouds separate the zones. The final round-seam weld is made at an enlarged section of the shell having an inner sleeve with the same internal diameter as the rest of the shell. To remove the shell for maintenance work on the tube bundle, the shell can be torch-cut at the bulged section, later rewelded and locally stress relieved. The inner sleeve protects the tubes from damage. (*Power*, Vol. 120, No. 3, p. 103.)

**Commonwealth Conference of Engineering Institutions**

Under the auspices of the Institution of Electrical Engineers, Overseas Committee for New South Wales, an informal social function was held in Sydney on March 19th, to give local members of the Institution the opportunity of meeting the president, Mr. T. E. Goldup, C.B.E., and the secretary, Mr. W. K. Brasher, C.B.E. The occasion of their visit was the Commonwealth Conference of Engineering Institutions from Canada, India, New Zealand, Rhodesia, South Africa, the United Kingdom and Australia. Some 40 members took part in the meeting which was held at the University Club. The visitors were welcomed by Mr. R. M. Barge (chairman, Overseas Committee for N.S.W.), who expressed the pleasure which Australian members felt at having in their midst the senior officers of the Institution. Responding, Mr. Goldup remarked that he counted himself as one of the most fortunate in a long line of presidents, in that he had had the privilege of meeting members of the Institution in almost every corner of the world. En route to Australia he and Mr. Brasher had spent some time in meeting groups of members in India and Singapore; soon they would be doing the same in Canberra and Melbourne. Everywhere there was the same problem of shortage of technical manpower which was proving so serious in Britain. There had been rapid advances in electrotechnology over the past ten years, but the application of new discoveries was proving a long and tedious process. It was the duty of every member of the Institution to try and persuade young men of ability who were looking for a career to come into electrical engineering and reap the benefit which would undoubtedly come from the application of the results of research. If the British Commonwealth was to retain its present position in the electrical world we must have more science teachers. That meant raising the status of teachers and encouraging men of the highest quality to join their ranks. Later the same evening, members attended a joint meeting in Science House, Sydney, when Messrs. R. W. J. Mackay, W. J. Moran, N. C. Wogan, H. L. Kingsmill and D. J. Vernon read a paper on "Electrification of the Sydney-Lithgow Railway Line."

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A contract worth £2½ million—the largest single order placed in this country by Poland since the war—has been awarded to **Metropolitan-Vickers Electrical Co. Ltd.** The order for two 120-MW steam turbo-alternator sets for installation in a power station near Katowice in the Dourbrowa coal district was placed by "Electrim" (the official Polish organisation dealing with the import and export of electrical equipment) with the agreement of the Board of Trade. The two generating sets—which are the largest ever ordered from this country for use in Europe—will be delivered during 1961. These reheat sets will have 3-cylinder turbines running at 3,000 r.p.m. and operating with steam conditions of 1,800 lb./sq. in., and 1,000/1,000 deg. F. The turbines will be direct coupled to generators rated at 120-MW 0.8 p.f. 13.8 kV, 3-phase, 50 c/s; the generators will be hydrogen cooled, using hydrogen at a pressure of 30 lb./sq. in.

* * *

**The Fisher Governor Co. Ltd.,** Airport Works, Maidstone Road, Rochester, Kent, have introduced two new electro-hydraulic valve operators. Type 340 has a maximum stem thrust of 600 lb., and is suitable for valve sizes from ¼-4-in., while the larger, type 350 develops a thrust of 2,000 lb., and is available for all valve sizes up to 16-in. Full details of the new units are contained in Bulletin E-350, issued by the company.

* * *

**The Incandescent Heat Co. Ltd.,** have issued a new leaflet V.53 dealing with the Incandescent-Laclede Tile Suspended Arch. The Incandescent-Laclede suspended roof is specially suited to high-temperature furnaces where a heavy thickness of insulation is required. This form of suspension is suitable for regenerator roofs, soaking-pit covers, slab and billet-heating furnaces, bogie hearth furnaces, aluminium reverberatory furnaces and suchlike. Incandescent-Laclede Arches are built under licence from the Laclede-Christy Company, a division of the H. K. Porter Company Inc., U.S.A.

**W. C. Holmes & Co. Ltd.,** Huddersfield, have issued a new publication (No. 69) entitled "Holmes-Elex Electrical Precipitators." This well-produced publication of 24-pages gives some useful information on electrical precipitation and precipitators; various illustrations of actual installations for many different industries are included. The Gas Cleaning Division of W. C. Holmes & Co. Ltd. was inaugurated more than twenty years ago in association with Elex A.G., of Zurich. In subsequent years this association has extended to include Koppers Company, Baltimore, U.S.A.; Apparatebau Rothemuhle, Germany; and several other companies in all parts of the world. Thus technical data gained from practical experience, which are vital to the successful development of electrical precipitation plant, are available not only from the company's extensive activities in the United Kingdom and the Dominions, but also from many other countries. During the past years more than 1,150 plants have been installed, by W. C. Holmes & Co. Ltd., and their associates, to meet many different problems in gas cleaning.

* * *

Space-heating for the new Safari Ltd. factory and offices at Croydon, Surrey, is provided by two **Henry Wilson Co. Ltd.** model-L.200 "Oil-heat" winter air-conditioners, which incorporate Wilson pressure-jet burners and operate with 35-sec. fuel-oil. Each unit has an output of 2,160 cu. ft./min. of air, which, with an oil-burner nozzle rated at 1.6 gal./hr., provides a heat output of 200,000 B.Th.U./hr.; the warm air being filtered and humidified before being distributed through a system of ducting. During the summer months these same units can be used to provide unheated air. The ductwork for this new installation was designed, manufactured and erected by Clarke, Hunt & Co. Ltd.

* * *

**Dr. W. H. Garrett,** director of Monsanto Chemicals Ltd., has been elected president of the British Employers Confederation in succession to **Sir Colin Anderson.**

**The English Electric Export & Trading Company** has obtained a further contract in the U.S.A., worth some 5½ million dollars, for Priest Rapids power station in the State of Washington. The company is to supply two more water turbine generating sets, each 83,000 kVA at 85.7 r.p.m. English Electric is already supplying the first eight turbines and generators and five transformers for Priest Rapids, in conjunction with Merritt-Chapman & Scott, who are undertaking the civil work as main contractors. When the award of the first contract was made in October, 1956, it was announced that The English Electric Company's share was some 25 million dollars. The Priest Rapids project is one of a chain of stations being built to develop water power along the Columbia River system in the Pacific Northwest. Its site is downstream from Grand Coulee, Chief Joseph and Rock Island Dams, but upstream of McNary Dam and immediately above the confluence of Snake River with Columbia River. The new dam and power house are an undertaking of Grant County Public Utility District No. 2 of Ephrata, Washington State. The total plant now to be installed by English Electric at Priest Rapids comprises 10 114,000 h.p. water turbines and 10 generators, each having an output of 83,000 kVA at 85.7 r.p.m. English Electric is supplying the five transformers of 183,000 kVA to raise the generating voltage of 13,200 to 230,000 volts for transmission to various consuming centres. The whole project is under the technical supervision of the Harza Engineering Company of Chicago, Illinois, whose services have been retained by Grant County P.U.D. as consultants.

* * *

A new leaflet (No. 112 M.P.) issued by **General Refractories Ltd.,** Genefax House, Sheffield, 10, contains details of Durax No. 14, a ready-to-use aluminous refractory cement, which can be applied as a jointing mortar, or as a protective wash over the surface of new firebrick work to seal off the pores and any fine fire cracks in order to make clinker adhesion more difficult.

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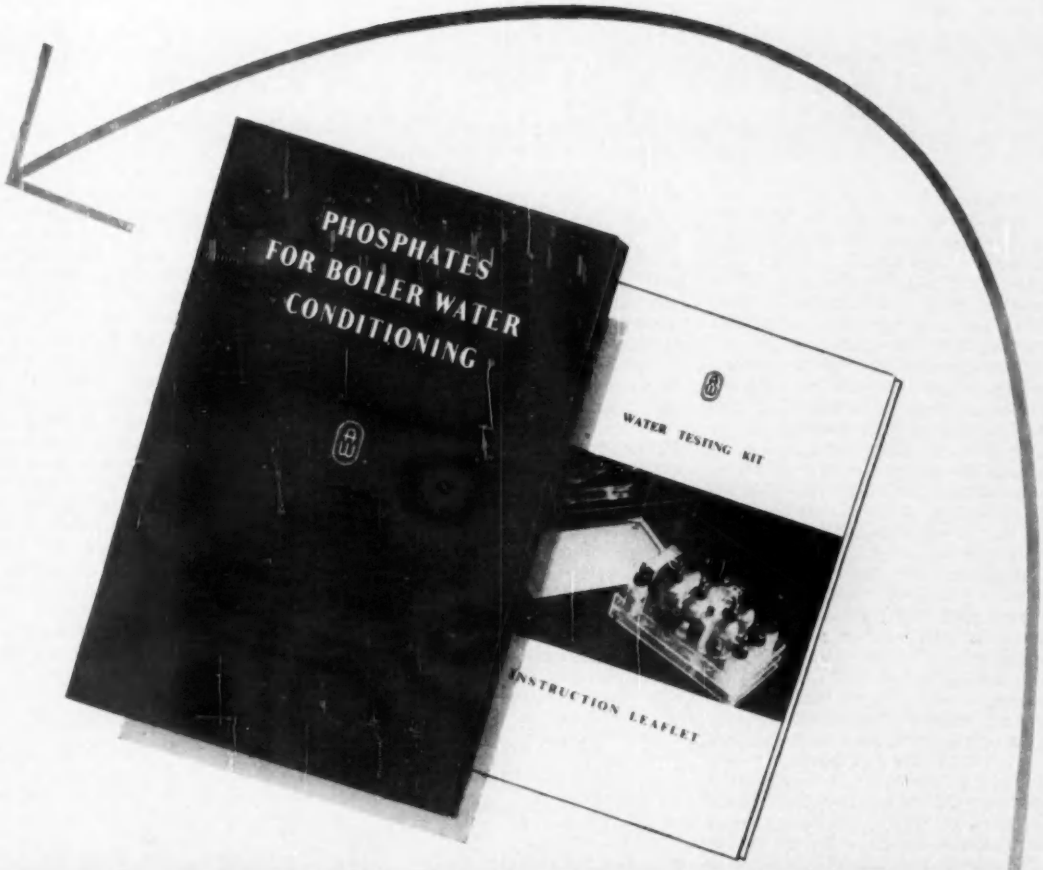


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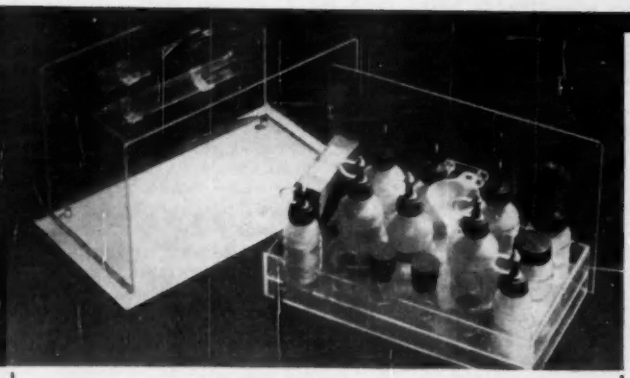

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# Latest Power Plant Patents

*These extracts from British Patent Specifications are reproduced by permission of The Controller of H.M. Stationery Office. (Complete British Specifications can be obtained from the Patent Office, 26, Southampton Buildings, London, W.C.2. Price 3s. 6d. each, both inland and abroad.)*

## Leak detection

This invention relates to an improved method for the detection of leaks or porosity which enables the point of leakage to be indicated or marked so that the necessary repairs can be readily effected. The invention is analogous to the well-known smoke test, but differs from it in that the use of smoke is avoided, as the method of detecting and indicating leaks in this case consists of applying a pressure-differential sufficient to cause leakage to take place, and the suspension of a liquid in a gas or "mist," which may if desired contain a dye, also in suspension. The invention can be used during the manufacture or fabrication of any container, chamber, vessel or any part of such units. It is especially useful for testing fabricated articles or structures which involve the use of riveted, welded or other joints, since leaks occurring at such points cannot be ordinarily detected until the article is put into service. It can also be used for testing castings for leakage or porosity. When the invention is to be used for testing a closed chamber or container, the mist is pumped into the chamber and allowed to expand. A characteristic of mists is that they consist of fine particles which will penetrate all interstices or minute crevices wherever air will go, and by maintaining a very small pressure differential through the article to be tested the mist will pass through a leak and be visible on the outside. It is sometimes desirable that the mist should contain a dye in suspension, which may be indelible, so that the point at which leakage occurs is clearly marked. The particular materials which are used for the production of the mist can be selected according to the requirements of any particular case ; thus an anti-corrosive material may also be carried in suspension. In some cases it may be necessary to select a material which will not under any conditions form an explosive or inflammable mixture. This condition arises, for example, if the repair of the leak involves welding inside a container. Provision may also be made, where necessary, for extracting the contents of the chamber after the test has been completed and replacing them with pure air. The invention is very convenient for the testing of boiler flues and casings. *British Patent No. 789,089 issued to Lister-Todd Engineering Corporation Limited. Complete specification published January 15th, 1958.*

## Contact condenser

One of the problems associated with the use of mixing condensers in which the steam is condensed by means of a condensate serving as cooling water and to re-cool the condensate in a closed system by means of atmospheric air is to prevent the penetration of air into the system, due to leakage, during the re-cooling of the condensate by the atmospheric air. Care has, therefore, to be taken that the operating pressure during the circulation of the condensate on its way from the mixing condenser, through the pump which maintains the circulation, back to the mixing condenser, exceeds the outer atmospheric pressure to an extent which will ensure the desired safety. For economic reasons it is desirable that this excess pressure shall be as small as possible. Therefore, it is necessary to maintain the minimum value of this excess pressure at a predetermined value by means of automatic regulation which will also take into account any possible variation in the electrical load. The maintenance of this excess pressure at the minimum value is connected with the danger, especially when the load changes at individual points of the system (i.e. at any point of the flow of the condensate) that the pressure may drop below atmospheric pressure. It is, therefore, of paramount importance to arrange that the pressure which is transferred to the pressure-responsive element operating the controlling valve shall be that of a point in the system where the pressure-drop prevailing in the condensate is always smallest under all circumstances of loading. Hydrodynamic considerations show that this point lies always at the hydrostatically highest point of the whole system. This arrangement solves the problem from a working and economic point of view because the controlling valve receives its control pressure from the highest point of the system. The controlling valve itself consists essentially of a suitable valve, or group of valves, which always adjust themselves in accordance with the amount of the circulating water, the outside temperature, and the load on the turbine, so that the pressure prevailing at the control point always retains the predetermined value which exceeds the pressure of one atmosphere. Since this is the point of lowest pressure in the system, it is ensured that the pressure of the condensate in the whole of the cooling system is always greater then atmospheric pressure. Referring to Fig. 1, the steam returned from the steam turbine (1) is condensed in the mixing condenser (2). Part of the mixture consisting of the condenser water and of the cooling water is delivered by the feed pump (16) and the pipe (12) to the boiler, while the remainder flows through the pump (3), and then through the pipe (5) to the air-cooled heat-exchangers (6). The condensate is cooled in the heat exchangers (6) and flows through the pipe (9) back to the mixing condenser (2). An

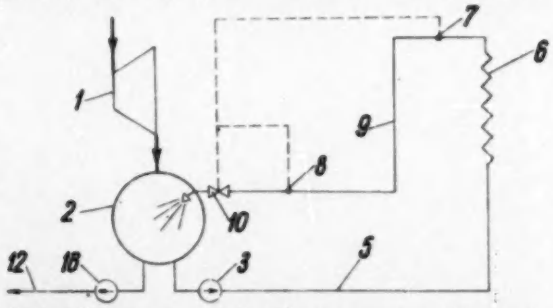



*Fig. 1. British Patent No. 790,410.*

automatically-controlled valve (10) is inserted directly before the mixing condenser in the pipe (9). The valve (10) is operated from a pressure-responsive element actuated by the controlling pressure from the highest point (7) of the re-cooling system. If the amount of the circulating water changes either owing to a variation in the turbine load, or owing to a change in the temperature of the atmospheric air, the valve (10) is so adjusted that the desired pressure at the point (7) is maintained. Since in the re-cooling system the pressure of the condensate is always greater than the pressure at the point (7), this ensures that in the whole of the re-cooling system, starting from the pump (3), through the heat-exchangers (6), up to the controlling valve (10), the pressure of the circulating water is everywhere greater than the atmospheric pressure. *British Patent No. 790,410 issued to Licencia Talalmanyokat Erterkesito Vallalat. Application in Hungary made December 22nd, 1954. Complete specification published February 12th, 1958.*

**Steam generator with gas recirculation**

This invention relates to a steam generator in which the superheated steam temperature is controlled by gas recirculation. The steam generator shown in Fig. 2 comprises a vertical furnace (10) fired with pulverised-coal, gas or oil, through burners (12), and having walls lined with steam generating tubes (14). The combustion gases pass upward and through furnace outlet (28) and then through a gas-pass (29) which leads to the lower end of stack (30). The combustion gases flowing through the gas-pass (29), pass successively through a superheater (32), economiser (34), main air-heater (36), compartment (38) of dust-collector (40) and induced-draught fan (42), from which they are conveyed to stack (30). The steam flowing through pipe (26) from drum (18) passes through the superheater (32) and is delivered to the header (44), at a predetermined temperature and pressure, from where it is passed through pipe (46) to the point of use. Connected in parallel with the economiser (34), air-heater (36), compartment (38) of the dust collector (40), and the induced-draught fan (42), is a by-pass duct (48) which has dampers (50 and 52) at its inlet and outlet respectively. In the duct (48) are arranged the auxiliary air-heater (54), compartment (56) of the dust collector (40) and fan (58). Communication is established between the gas-pass (29) and duct (48) at a location in each between the air-heater and dust-collector section by means of connection (60), the flow through this connection being controlled by valve (62). Connected with the outlet of fan (58) is duct (76) which leads to the furnace (10), so that combustion gases may be re-circulated to the furnace. Flow through duct (76) is controlled by means of valve (78). The two fans (42 and 58) are preferably driven by a single motor (75) which need only have sufficient power to handle the volume of combustion gas generated at the maximum boiler load. Combustion air is supplied to furnace (10) at a location adjacent to the burners (12), by means of fan (64), with the air successively flowing through air ducts (66 and 68), air-heater (36) and duct (70), from which it enters the furnace. Connected in by-pass relation with the air-duct (66) is air-heater (54) with dampers (72 and 74) being provided at the inlet of duct (66) and air-heater (54), respectively, to control the flow through it. In operation, when the boiler is working at maximum or near maximum load, dampers (50, 74 and 78) are closed and valves (52, 62 and 72) are open, so that both the fans (42 and 58) are acting as induced-draught fans with combustion gases flowing through the gas-pass (29), and also through connection (60) into duct (48). As the load on the boiler is decreased, it becomes necessary to recirculate controlled quantities of combustion gases in order to maintain the superheated steam in the header (44) at a constant temperature. Thus, as the load decreases, dampers (50, 78, and 74) are moved toward the open position while dampers (52, 62 and 72) are moved toward the closed position, the adjustment being such that the pressure at the outlet of fan (58) is increased to a predetermined value above the pressure within the furnace (10), and the gas flow through duct (76) is equal to the amount needed to give the required steam temperature in header (44), with the gas flow through air-heater (54) being substantially equal to that through duct (76). The rate at which gas is recirculated to the furnace will increase with a lowering of the load, until the point is reached where maximum gas recirculation is required. At this point dampers (52, 62 and 72) may be closed and dampers (50, 78 and 74) may be completely open. However, it may be desirable, even at maximum gas flow through duct (76), to design the system so that valve (52) will be partially closed thereby permitting the combination of these two dampers to control the pressure at the outlet of fan (58) and the flow through duct (76). The rate at which gas is recirculated to the furnace is controlled by the adjustment of dampers (52 and 78), and this adjustment may be either manual or automatic, with the control being such as to maintain the steam in the header (44) at a substantially constant temperature. *British Patent No. 791,239 issued to Combustion Engineering Inc. Complete specification published February 26th, 1958.*

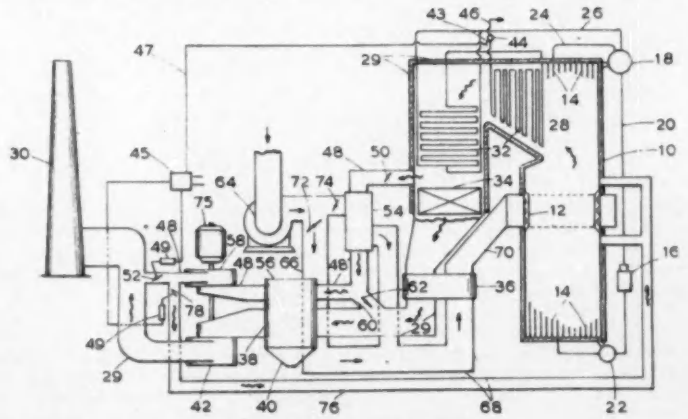



*Fig. 2. British Patent No. 791,239.*

**Boiler with fluidised fuel bed**

This invention relates to an improved method of transferring and absorbing heat in a boiler by effecting the generation or superheating of steam utilising heat evolved in the burning of fuel in a fluidised bed of an active oxidation catalyst. Fig. 3 shows a drum-like chamber (10) containing a bed (11) of particles of an active oxidation catalyst. The fuel to be burned is supplied to the fluidised bed through the pipe (12) and injected into the lower portion of the bed by nozzles (14) in the

pipe (12). A portion of the air for combustion may be admitted with the fuel through the pipe (12). Generally at least part of the secondary air for combustion would be supplied through the windbox (16) below the bed. The oxidation catalyst of which the bed is made up is a substance which assists in the reaction of an oxidisable material such as fuel oil, gas, or coal with

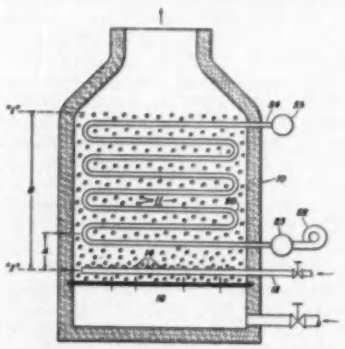


*Fig. 3. British Patent No. 792,682.*

oxygen without itself being affected in the process but which effects complete combustion of the fuel and is capable of releasing substantially its optimum heating value. The heat absorbing surface (20) is submerged in the bed, this section being represented in the form of a sinuous coil to the inlet header (23) of which water is supplied by a pump (22), and from the outlet (24) of which hot water, saturated or superheated steam, is led off to a point of use from the outlet header (25). As shown, the heat absorbing surface (20) submerged in the bed extends from near the top level "t" down to a point short of the level "f" at which fuel is introduced. The invention also allows for the heat absorbing surface, under certain circumstances, to be submerged in the lower portion of the bed. The fuel and primary air is supplied to the bed at the level "f" through the pipe (12) while secondary air comes from the windbox (16), the rate of supply being so regulated that the bed is maintained fluidised in such relationship to the activity of the catalytic material employed as to effect complete oxidation of the fuel in a zone "A" which has a vertical height less than the portion "B" of the bed extending between the level "f" at which the fuel is introduced and the level "t" where the products of oxidation separate from the bed. Through the use of an active oxidation catalyst which enables the complete oxidation of the fuel supplied to the bed in the zone "A," which occupies less than the height of the bed above the level "f" at which fuel is introduced, it is possible to increase the amount of heat that may be absorbed from the burned fuel because a differential in temperature, which may be 100 deg. F. or more, is achieved between that existing at the bottom of the bed, or in the zone "A," and the top of the bed "t" where the products of combustion separate from the bed. This differential in temperature is brought about because of the oxidation of the fuel in the zone "A" at the lower part of the bed and the absorption of heat by the heat absorbing surface (20) from the products of combustion as they pass through the portion of the bed above the zone "A" in which the major part of the heat transfer surface is submerged. Inasmuch as the catalyst is active the entire bed (11) need not be at activation temperature; therefore, lower exit temperatures at point "t" result with complete combustion. As a result of this temperature differential it is possible to absorb a greater amount of heat from fuel burned in the bed than has heretofore been thought possible, with the result that a much greater amount of heat may be absorbed from the burning fuel and imparted to the fluid circulated through the heat absorbing surface (20) in the bed to heat it, to vaporise it and/or to superheat it. *British Patent No. 792,682 issued to Combustion Engineering Inc. Complete specification published April 2nd, 1958.*

**Water tube hot-water boiler or steam generator**

This invention relates to hot-water boilers or steam generators of the water-tube type, and has for its principal object the provision of an improved water-coil construction, which will define the combustion chamber and will ensure economy and successful low-fire operation. The combustion chamber (20) in Fig. 4 exists solely by virtue of the provision of a water-tube coil composed of a series of helically wound convolutions which constitute part of a coil assembly (21). The group (26) of contiguous helical circular turns and the group (28) of spiral turns, together with a limited portion of the header assembly, define the generally cylindrical combustion chamber (20) by presenting what in effect amounts to a solid cylindrical wall surrounding the chamber, and a similarly solid radial wall at the end of the chamber remote from the fire-pot, or furnace, (14). These walls, since they are composed of the exposed inner curved surfaces of the various tube turns of the groups (26 and 28), present a generally corrugated or sinuous heat-transfer area having an increased surface area over the usual smooth cylindrical surface presented in conventional boiler constructions; but what is equally important is the fact that these corrugated surfaces permit what may be termed a "wiping action" by the highly turbulent end of the combustion chamber (20) and the gases are caused to take a path back through the chamber to create toroidal swirls, as shown by the arrows in Fig. 4, with portions of the swirls recurrently wiping against the inner faces of the contiguous tubes. In this manner any pockets of unburned gases are wiped clear of the surface of the tubes and are drawn back into the central core of combustion where they will mix with the burning gases and become reheated and intermixed

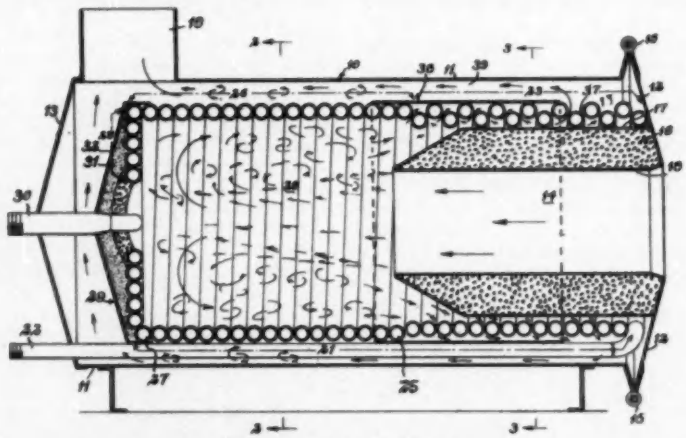


*Fig. 4. British Patent No. 792,747.*

with ignited fuel and air mixtures. The influx of freshly ignited fuel and air in the chamber, in the form of a central core or jet, provides pressure which forces the products of combustion towards the front of the combustion chamber and causes them to be directed against the group (23) of contiguous tubes which provide discharge passages by virtue of their positioning. Although the various turns throughout the water-tube coil may exist in their free state, adjacent turns may be suitably secured together, preferably by welding, whereby adjacent turns of tubing are in intimate heat contact with respect to each other as well as being firmly anchored to each other. *British Patent No. 792,747 issued to Vapor Heating Corporation. Complete specification published April 2nd, 1958.*

**Grate-cooling arrangement**

This invention relates to cooling arrangements for the grates of steam generators in which the side walls of the combustion chamber are cooled by a lining of water-tubes which extend between upper and lower horizontal headers. Fig. 5 shows a steam generator having at the front a transverse steam drum (3), unheated front downcomer tubes (2) and unheated rear downcomer tubes (4) arranged at the four corners of the combustion chamber. The front downcomers (2) and the upper headers (6) are connected to the steam drum (3). The lower headers (1) extend between the downcomers (2) and the downcomers (4) which depend from the headers (6). Most of the evaporator tubes (5) extend between the headers (1) and the headers (6), a few of the tubes being connected to the steam drum (3). A travelling chain-grate stoker, the track of which is indicated by chain lines (8), is arranged so that the upper run of the grate is substantially level with the lower headers (1). Along each side wall in front of the lower header and slightly above the grate track are two pairs of grate-cooling tubes (7 and 7a). The tubes (7a) are displaced relatively to the tubes (7) along the length of the side wall. Considered in their relative position in the rear and front of the combustion chamber, the tubes (7a) may be said to lie behind the tubes (7). The tubes (7) lie one above the other, as do the tubes (7a). Each tube (7) is in axial alignment with a tube (7a). On each side wall the front end of each tube (7) is connected by an integral bend to the downcomer (2) and its rear end is connected to the header (6). The rear end of each tube (7a) is connected by an integral bend to the downcomer (4) and at its front end by an integral bend to a riser (9a) connected to the header (6). As can be seen in Fig. 6, the tubes (7 and 7a) are supported on a beam (19). They are protected by cast-iron plates (10). Bolts (20) secure the plates to one another and to straps (11) by which they are tied to the header (1). The header (1) is protected by heat insulating material (21). The evaporator tubes (5) are inclined inwardly from the header (1) and then rise vertically to form the lining for the combustion chamber side wall (22). The riser tubes (9 and 9a), which are equal in diameter to the tubes (5), are inclined outwardly from the tubes (7 and 7a) until they reach the level of the lining tubes (5), from where they rise vertically to form part of the lining. *British Patent No. 792,764 issued to H. Vorkauf. Complete specification published April 2nd, 1958.*

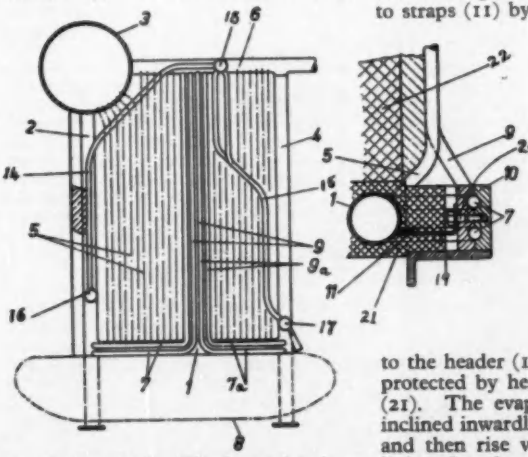
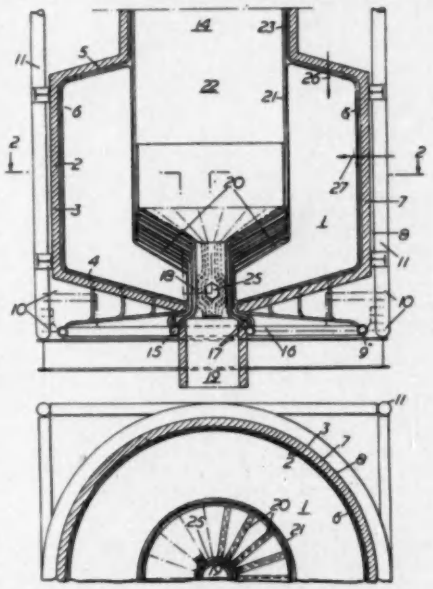


*Fig. 5 (extreme left). Fig. 6 (left). British Patent No. 792,764.*

**Furnace chamber for ash-containing fuel**

This patent specification relates to furnace chambers of the type adapted to burn an ash-containing fuel, having wall cooling-tubes covered with refractory material, a slag outlet for the removal of slag in molten form at the bottom of the chamber, and a tubular slag-screen extending across the gas-flow path leading from the furnace chamber. Figs. 7 and 8 show a cylindrical furnace chamber (1) with a floor (4) inclined towards a central opening, and a roof (5) which inclines to the top of a cylindrical concentric wall (21) extending from the top of the furnace chamber and separating the furnace chamber from a gas outlet passage (22). The outer cylindrical wall (3), the floor and the roof of the furnace chamber are lined with evaporator tubes (2) and the means of connecting these into the circulatory system of the steam generator includes an annular distributor (9) to which the lower ends of the tubes are connected. Connected to the distributor (9), or alternatively directly to the downcomer tubes (11) by supply tubes (16), is a further annular distributor (15) from which a system of tubes (17) emanates. The tubes (17) are included in a closed wall (18) rising from the floor of the furnace chamber and forming the upper part of the slag discharge shaft (19). Above the wall (18) the tubes (17) extend radially outwards and rise to the bottom of the wall (21) to form a slag-screen (20) spaced above the floor of the furnace chamber. Above the slag-screen the tubes (17)



*Figs. 7 and 8. British Patent No. 793,032.*

continue to rise in the wall (21). The side of the tubes (17) in the wall (21) facing the furnace chamber (1) have welded to them studs, the studs and the tubes being covered with refractory material. A similar method of construction is adopted on the inner side of the wall (21) over a lower portion of the gas outlet passage (22). Above the gas outlet passage the tubes (17) and the tubes (2) serve to line the wall (23) of the radiation chamber (14) which extends upwards from the top of the passage, with or without alteration of cross section. The furnace chamber is arranged to be fired by a number of pulverised-fuel burners, each arranged to discharge downwards from the roof (5) as indicated by the arrow (26), through the wall (3) in a radial direction as indicated by the arrow (27), or in a direction adapted to produce whirling around the wall (21). In operation, a part of the slag is deposited in the furnace chamber (1) regardless of the direction of discharge of the burners, and such slag can flow without hindrance by the slag screen to the slag outlet (25). Of the slag remaining in the gases, a considerable portion is deposited on the slag screen (20) from which it flows to the bottom of the furnace chamber and into the vicinity of the slag outlet. Thus, the design tends to make it possible to maintain the fluidity of the slag flowing to the slag outlet. *British Patent No.* 793,032 *issued to Babcock & Wilcox Ltd. Complete specification published April 9th*, 1958.

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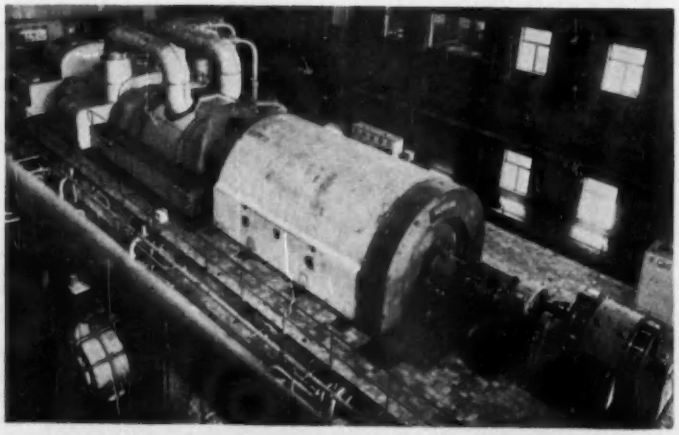
The first 100-MW turbo-alternator to be installed by **C. A. Parsons and Co. Ltd.** in the Ferrybridge "B" (Yorkshire) power station is now running on load to C.E.G.B. requirements. The first of three such machines for this station, the turbine has three cylinders, and with the exception of a two-row velocity wheel on the H.P. shaft is fitted with reaction blading throughout. The machine runs at 3,000 r.p.m., the alternator generating at the standard U.K. frequency of 50 c/s. Initial steam conditions are 1,500 lb./sq. in. at 975 deg. F., with re-heating to 950 deg. F. between the H.P. and I.P. stages. Intercepting valves fitted before the I.P. cylinder provide a safeguard against the large quantity of steam stored in the re-heater and connecting pipes flowing into the cylinder in the event of a sudden loss of load. Thrust bearings are located at the inlet ends of the H.P. and I.P. shafts, and a flexible coupling between these shafts absorbs axial expansion of the rotor assembly. A double-shell construction is used for the H.P. cylinder. Six similar machines are on order for the Aberthaw power station of the C.E.G.B. The 100-MW turbo-generators make an interesting comparison with the Parsons 120-MW machines, 13 of which are on order. These, with steam at the same initial pressure of 1,500 lb./sq. in., employ temperatures of 1,000 deg. F. and re-heat to 1,000 deg. F. The H.P. shaft has been reversed, its inlet end being adjacent to the I.P. cylinder, and the flexible coupling between H.P. and I.P. shafts has been eliminated. All couplings are rigid, and the one thrust bearing is located at the inlet end of the H.P. turbine. These machines are destined for the Rugeley, Skelton Grange, Drakelow, and Kincardine stations respectively.)

* * *

Construction of the first of 12 heat-exchangers for the Bradwell Nuclear Power Station is nearing completion at the Thornaby Works of **Head Wrightson & Co. Ltd.** These heat-exchangers, fabricated in 19/16-in. thick steel plate, are 95-ft. long, 20-ft. in diameter and weigh over 200 tons. When the first heat-exchanger is completed later this month it will be launched into the river Tees from Head Wrightson's slipway and towed round the coast to Bradwell at the mouth of the Blackwater Estuary in Essex. On arrival the exchanger will be landed and lifted on to its foundations by the Goliath crane recently completed.

* * *

**Igranic Electric Co. Ltd.,** Bedford, announce that **Mr. R. L. Paice,** who has been sales director since 1948, has relinquished this position. **Mr. A. W. Page,** as sales manager, is now responsible for the Home and Export Sales Organisation. Mr. Paice as a director of the company will carry out special assignments of the board.



*Turbine house at Ferrybridge Power Station (C.E.G.B., Yorkshire Division) showing the first of the C. A. Parsons 100-MW turbo-alternator set to be installed there.*

**Metropolitan-Vickers Electrical Export Co. Ltd.** has received an order from Agua y Energia (Argentine Power and Water Board) for the supply and construction of seven 132 kV substations to be installed in the Buenos Aires City area. The order, approaching £5 million in value, is the largest order for this type of equipment ever placed with the company. In addition to supplying the complete electrical equipment, Metropolitan-Vickers will act as main contractors for the civil works, which will be carried out by local contractors. The contract value includes 105 million pesos (approximately £1 million) for the civil works. The first three substations will be completed during 1961 and the whole by 1962.

* * *

**Mr. Frank Faux,** A.M.I.E.E., chief assistant engineer to the system planning engineer of the Central Electricity Generating Board, has been appointed station planning and development engineer of the Board. He was appointed assistant engineer in the station development department at the headquarters of the Board in 1946, and three years later, following the reorganisation of the electricity supply industry, became senior assistant engineer in the generation design branch of the chief engineer's department of the British Electricity Authority, subsequently becoming specialist engineer and principal assistant engineer in the same branch. Mr. Faux was appointed chief assistant engineer to the system operation engineer in 1954, and on the recent reorganisation continued as chief assistant engineer to the system planning engineer.

* * *

**Mr. F. P. Liebert,** B.Sc.(Tech.), A.M.I.Prod.E., has been appointed works manager of The English Electric Company's **Rugby and Whetstone (Leicester)** establishments, responsible to the general manager (Rugby and Whetstone), **Mr. E. M. Price.** When the company took over the Ministry of Supply's Gas Turbine Establishment at Whetstone in 1955, Mr. Liebert became manager of these works. He has held this position ever since, and will continue in his new appointment to be responsible for industrial gas turbine activities at Whetstone.

* * *

**Woodall-Duckham Construction Co. Ltd.** announces that it has established a high-pressure processes division, with **Mr. H. S. Cheetham,** M.I.Mech.E., being appointed as director in charge.

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# NOTES *Personal* AND *Industrial*

The Electricity Council have appointed to the post of establishments officer, **Mr. E. Landucci,** who for the past eight years was assistant director of establishments of the Central (formerly British) Electricity Authority). Mr. Landucci joined the staff of the West Midlands Joint Electricity Authority, in whose service he remained for over 20 years and of which he became deputy clerk. On the reorganisation of the electricity supply industry in 1948, he became secretary of the B.E.A. South-East Scotland Division, and joined the headquarters staff during the following year.

* * *

**Mr. S. H. Clarke,** C.B.E., M.Sc., Hon.M.I.FireE., has been appointed as director of the New Research Station now being built for the D.S.I.R. at Stevenage for fuel and process research. Mr. Clarke is the present director of the Fire Research Station at Boreham Wood, run jointly by the D.S.I.R. and the Fire Offices' Committee. The programme of the new station will include, as major items, researches on atmospheric pollution, the production of oil from coal and aspects of mineral processing.

* * *

Metropolitan-Vickers Electrical Co. Ltd. announces that **Mr. N. R. D. Gurney,** A.C.G.I., M.I.E.E., manager Plant Department, who, since May, 1951, has been chief engineer Electrical General Engineering Department, covering the industrial (including marine) mining and rolling mill sections, is now appointed as sales manager, Plant Department. Mr. Gurney succeeds **Mr. R. J. Cochran,** who is seconded to special duties.

* * *

After 50 year's association with the products of G. & J. Weir Ltd., and of Drysdale & Co. Ltd., **Mr. Leslie C. Brown,** Birmingham office manager and technical representative of G. & J. Weir Ltd., Cathcart, Glasgow, retired on March 31st, 1958. He is succeeded by **Mr. Gavin Murison,** who has been transferred from Weir's London office.

* * *

**Mr. F. G. Brewer,** O.B.E., who has been secretary to the Gas Council since its formation in 1948, will retire from that office at the end of September. The Council has appointed as his successor the chief accountant of the Council, **Mr. Wilfrid Bailey,** F.S.A.A., F.I.M.T.A.

* * *

The Cambridge Instrument Co. Ltd. has announced the following appointments:— **Mr. L. F. Cooke,** previously head of the Industrial Sales Department, has been appointed commercial sales manager; **Mr. A. T. Jones** has been appointed sales manager of the Mechanical Thermometer Division at Finchley; and **Mr. S. A. Bergen,** M.B.E., M.I.E.E., has been appointed chief development engineer of the Cambridge organisation.

It is with regret that we record the death on April 6th, at the age of 52, of **Mr. A. R. Clague,** M.Eng., A.M.I.Mech.E., A.M.I.E.E., who was appointed controller of the South Western Division of the Central Electricity Generating Board at the beginning of this year. Upon nationalisation of the electricity supply industry in 1948, Mr. Clague was appointed generation engineer (operation) in the Midlands Division of the B.E.A., and in 1953 became chief generation engineer (operation) of that Division.

* * *

**Mr. W. P. Scott,** who for 22 years was manager of the Condensing Department of Worthington-Simpson Ltd., retired on March 31st. The Condensing Department is now administered from Newark by **Mr. T. Trowsdale,** sales manager, and **Mr. T. Bennett,** contracts manager. All enquiries relating to condensing plant and associated equipment should, in future, be addressed to the company at Newark.

* * *

The Council of the **Combustion Engineering Association** have appointed the following to hold office for the year 1958/59:— President, **Mr. S. P. Chambers,** C.I.E., B.Com., M.Sc.(Econ.), Imperial Chemical Industries Ltd. Vice-Presidents, **Sir John Charrington,** Charrington, Gardner, Locket & Co. Ltd., **Mr. G. D. Elliott,** John Thompson (Australia) Pty. Ltd., **Mr. H. C. Hawkins,** M.Inst.F., A.M.I.Mech.E., The British Xylonite Co. Ltd., **Sir Percy Sanders,** C.B.E., J.P., A.M.I.Mech.E., Davy, Paxman & Co. Ltd., **Mr. R. H. F. Thomas,** O.B.E., National Coal Board; **Sir Edward Thompson,** J.P., M.A., John Thompson Ltd.; Chairman of the Council, **Mr. L. N. Horne,** F.Inst.F., M.Inst.T., Charrington, Gardner, Locket & Co. Ltd., Honorary Treasurer, **Mr. E. W. Parnes,** M.Inst.F., A.M.Inst.B.E., Riley (IC) Products Ltd.

* * *

The National Coal Board announce that **Mr. R. J. Moffat,** C.B.E., their director-general of marketing, is to retire from the Board's service at the end of June. **Mr. F. Wilkinson,** manager of the Board's London and Southern Region sales office, has been appointed to succeed him.

* * *

**Davy and United Engineering Company Ltd.,** states that all its Sheffield activities are now concentrated at Darnall Works, Sheffield, 9, and that it has disposed of Park Iron Works. Darnall Works thus becomes the head office of the company.

* * *

**Mr. H. L. Trafford,** M.I.Mech.E., was installed as chairman of the North Western Section of the Institute of Fuel during the annual general meeting which was held at Manchester on April 9th.

**Mr. W. J. Weston,** Assoc.I.E.E., M.Amer.I.E.E., has been appointed Birmingham area manager of Lancashire Dynamo Group Sales Ltd. He joined Foster Transformers Ltd. (a Lancashire Dynamo Group Company) in 1949, becoming senior branch engineer at the Birmingham area office of the Lancashire Dynamo Group in 1954.

* * *

The Electricity Council have appointed **Mr. C. M. de L. Byrde,** M.B.E., M.A., A.C.I.S., to be assistant secretary (Administration). Mr. Byrde, who was educated at Bradfield and Oxford, joined the electricity supply industry in 1949 and, until his appointment, was an administrative officer in the secretary's office of the council.

* * *

An arrangement has been made whereby **Whiffen & Sons Limited** and the **"Alfloc" Water Treatment Service of Imperial Chemical Industries Limited** will co-operate in the development in the United Kingdom of the use of "Zerox" (35 per cent. hydrazine solution) for the de-oxygenation of boiler feedwater. Deliveries of "Zerox" and technical advice on its use will be available from Whiffen & Sons Limited, Fison House, 95, Wigmore Street, London, W.1, or from "Alfloc" Water Treatment Service, in the latter case via I.C.I. sales offices.

* * *

Ruston Thermax solid-fuel boilers are to be manufactured in Australia by **Westeels Industries Ltd.,** under licence from **Ruston and Hornsby Ltd.,** of Lincoln. The various boilers will range in capacity from 1,000 to 20,000 lb./hr., and will be made at Westeels' Silverwater plant. They will be the first of their type to be made available in Australia.

* * *

**Short & Mason Limited,** announce that they have signed an agreement with **Aktiengesellschaft Chemisches Institut Dr. A.G. Epprecht,** Zurich, whereby they will act as sole agents in Great Britain for the range of Drage Instruments. An instrument application department has been set up to deal with enquiries and advise on the use and installation of the instruments which include torsional viscometers and rheometers, also plant assemblies for automatic control of viscosity. In addition, the new Drage Multitest tensile, compression and bending test machine will be available through Short & Mason Limited, Aneroid Works, 280, Wood Street, Walthamstow, London, E.17.

* * *

We have received from **General Refractories Ltd.,** Genefax House, Sheffield, 10, a copy of a new brochure (publication No. 82 M.P.3M) which deals with "Silimax" bricks—a new range of refractory materials which are claimed to withstand high-temperatures and severe operating conditions.

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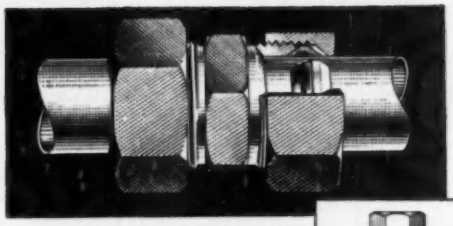

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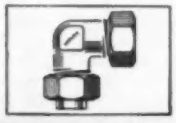

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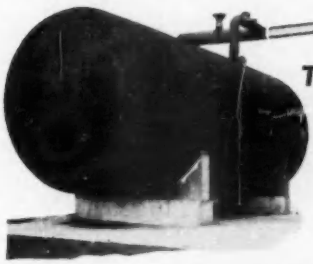

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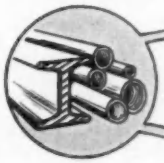

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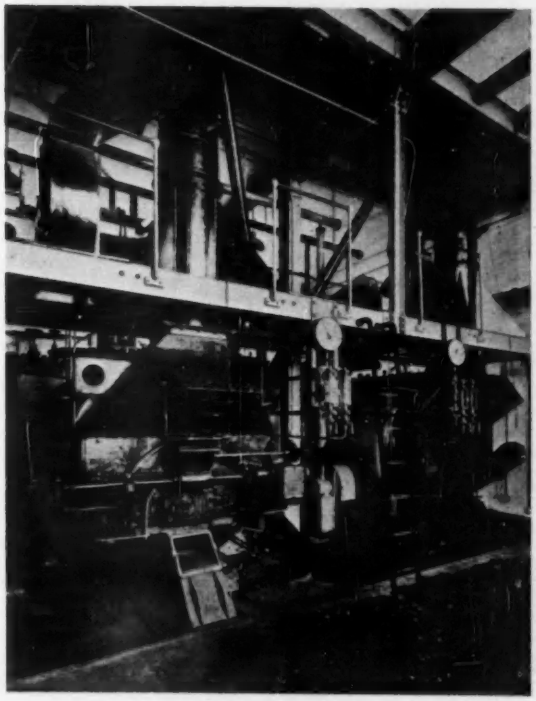

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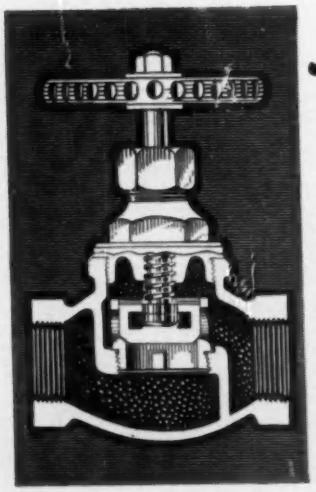

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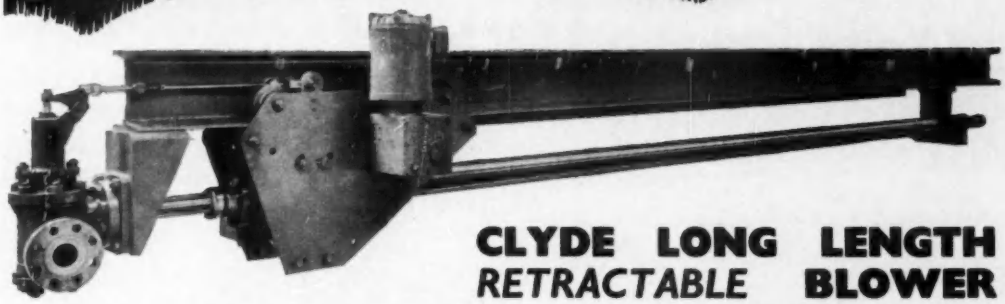

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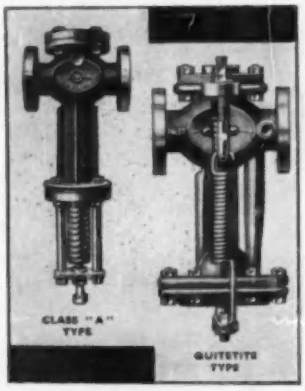


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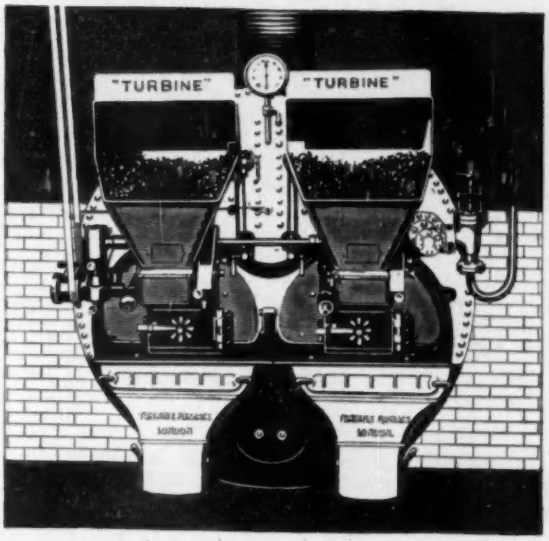


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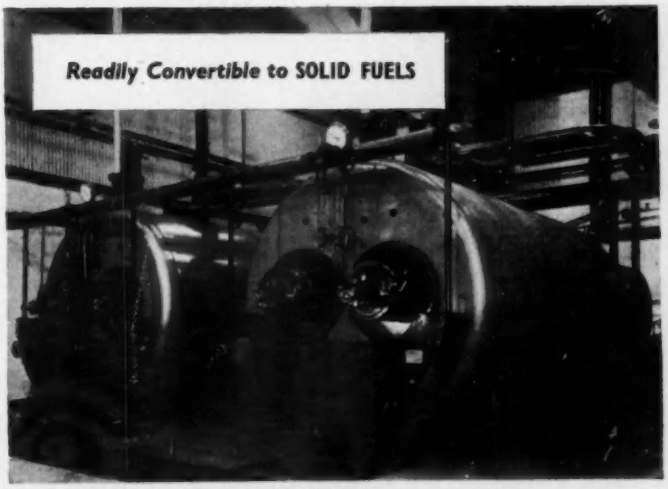


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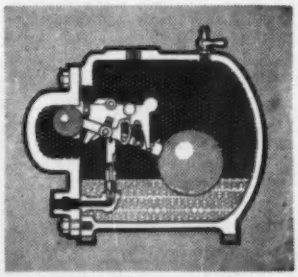

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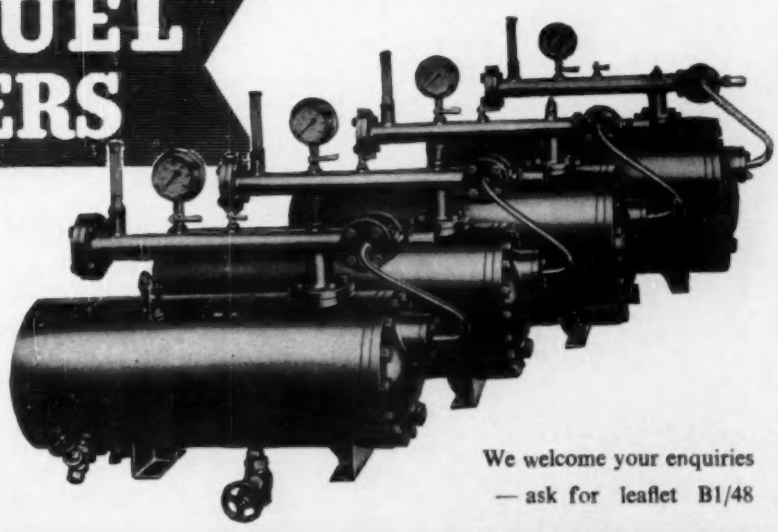

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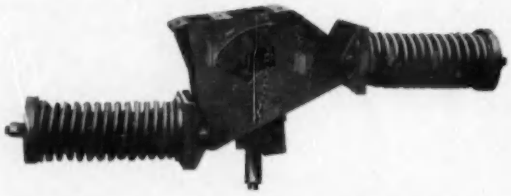

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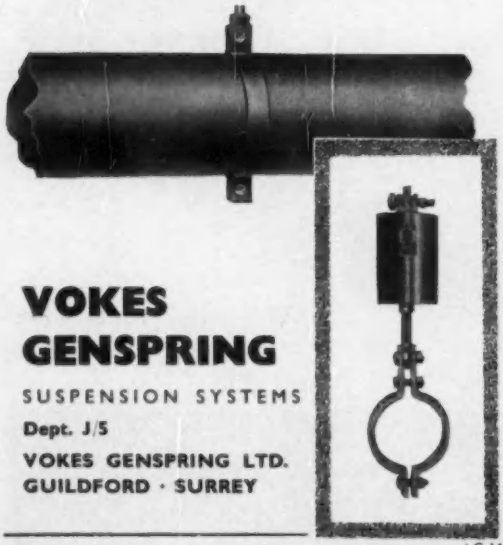

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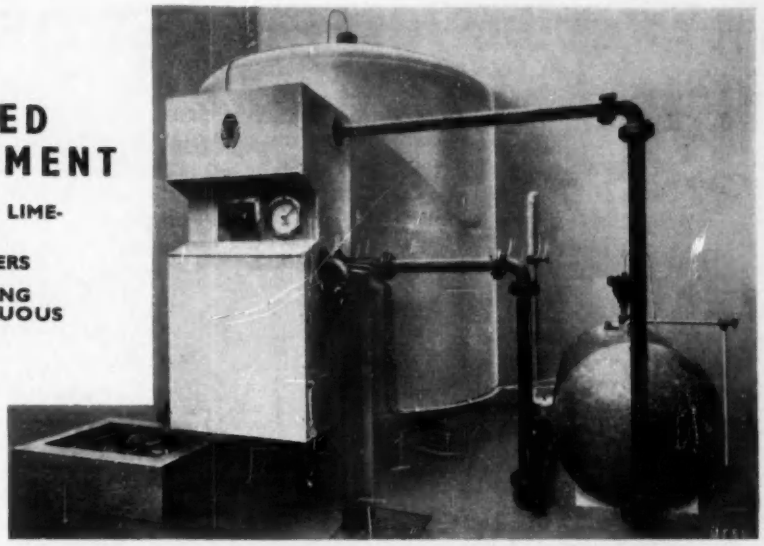

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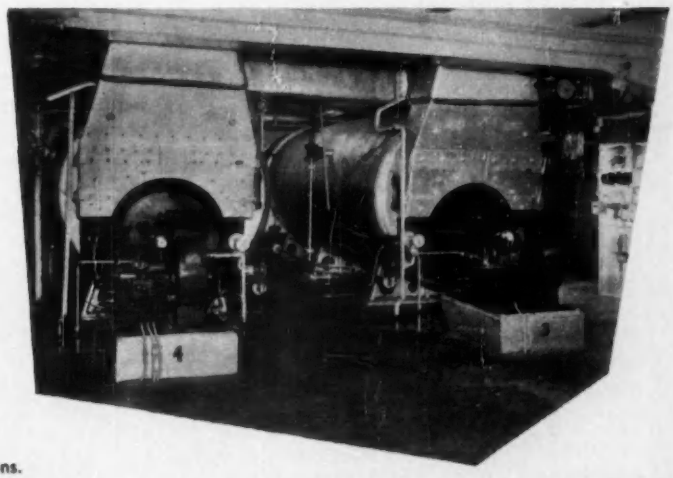

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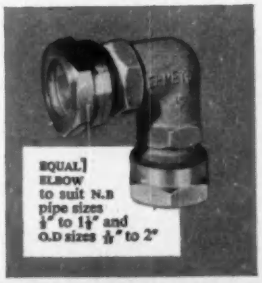

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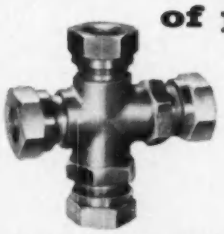

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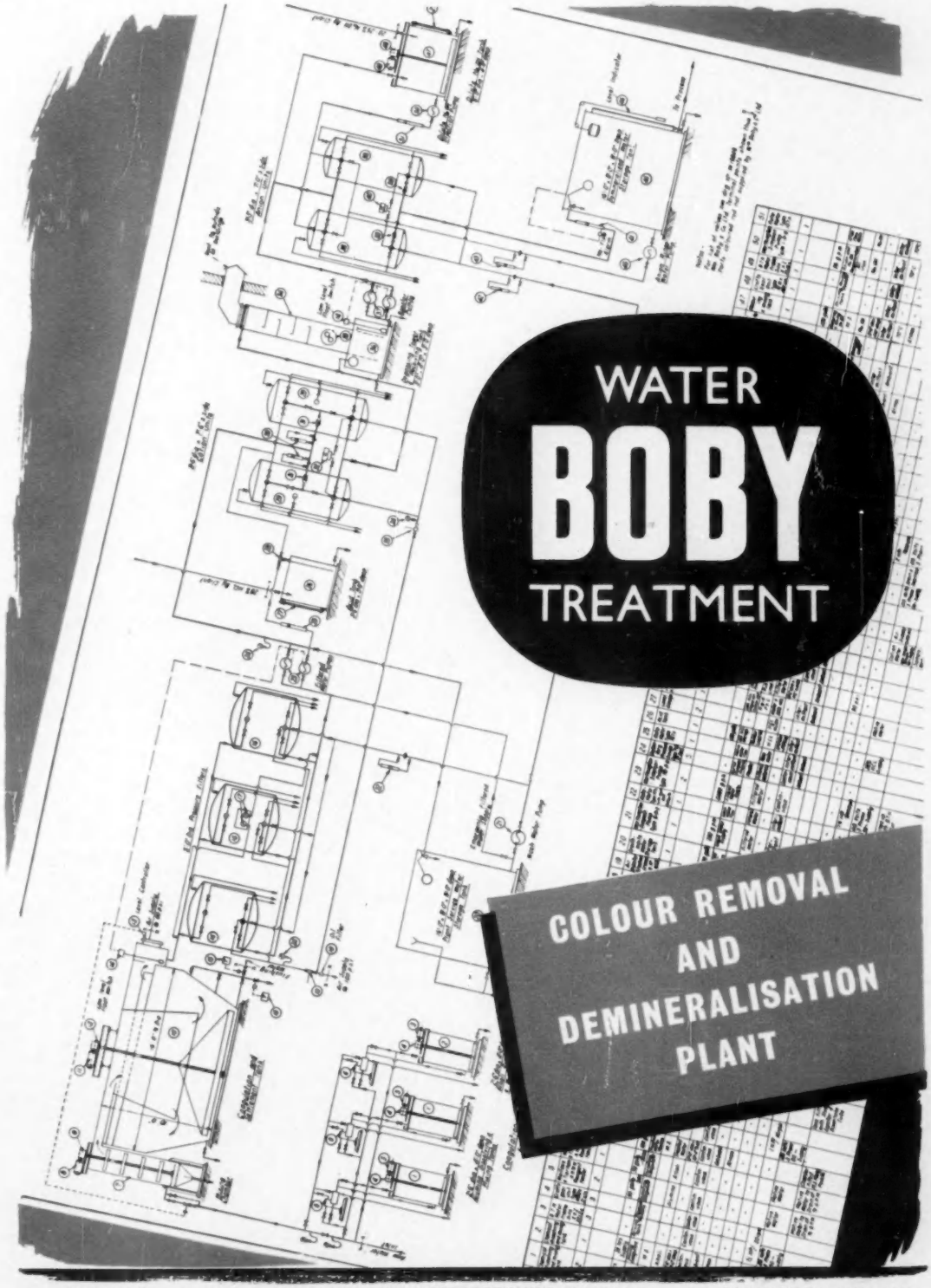


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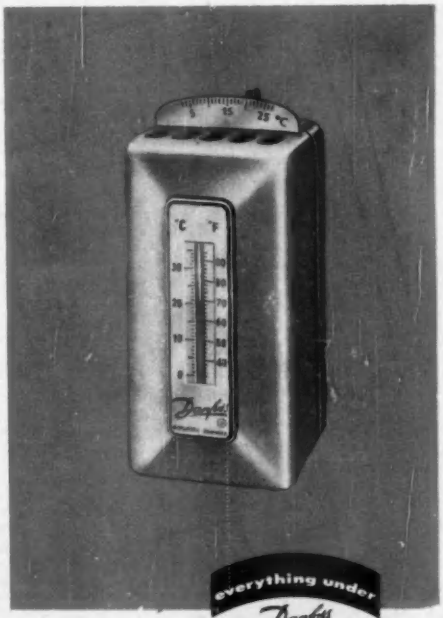


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